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LPGS Critical Design Review

■ Opening Comments	J. Henegar
■ System Overview	R. Hamilton
■ Hardware Architecture	K. Jeletic
■ Operational Scenarios	K. Jeletic
■ Level 1 Product Formats	L. Lindrose
■ Performance Analysis	W. Wang
■ LPGS Software Subsystem Design	
• Design Overview	B. Pedersen
• End-to-End Scenarios	B. Pedersen
• User Interface	O. Mechaly
• Data Management Subsystem	S. Beckwell
• Process Control Subsystem	B. Pedersen
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• Quality Assessment Subsystem	S. Kraft
• Anomaly Analysis Subsystem	B. Nair
■ System Test	E. Crook
■ Conclusion	J. Henegar

LPGS Critical Design Review

Design Overview

- Design methodology
- LPGS context diagram
- External interface design assumptions
- Design philosophy
- LPGS software architecture
- LPGS subsystem overview
- LPGS database
- LPGS COTS products
- Interprocess communications
- Key terms
- LPGS directory structure
- LPGS logging
- Software reuse

LPGS Critical Design Review

Design Methodology

- Followed SEAS System Development Methodology for design development
- Generated design products
  - Structure charts
  - Module specifications
  - Data dictionary
  - PDL for high-level units

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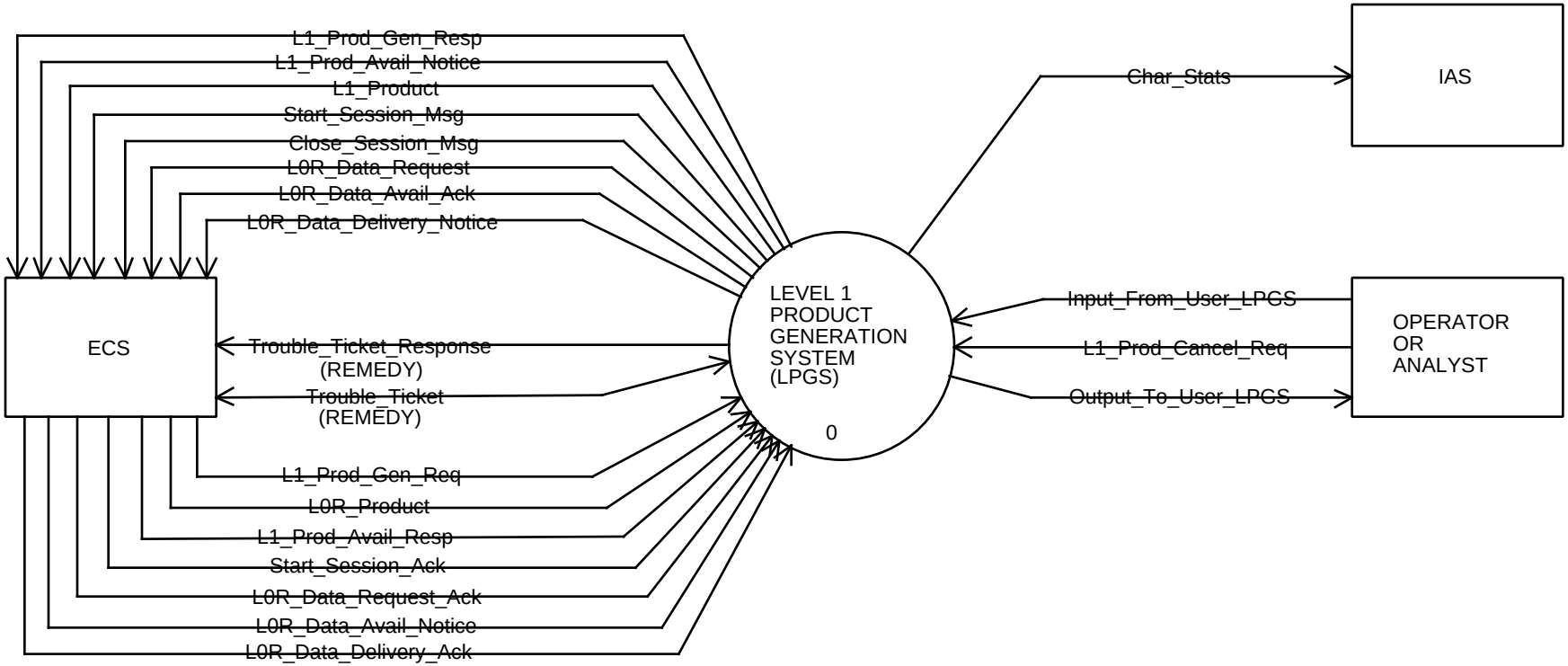
LPGS Critical Design Review

LPGS Context Diagram



LPGS Critical Design Review

External Interface Design Assumptions

- **ECS**
  - **LPGS design is based on LPGS/ECS interface concept**
  - **ECS provides product requests for "just-in-time" processing**
  - **ECS validates product requests before sending to LPGS**
  - **LPGS has access to the ECS trouble ticket system**
  - **ECS operator notifies LPGS operator when**
    - **Cancellation request received**
    - **Trouble ticket assigned to LPGS**
- **IAS**
  - **IAS has access to LPGS database using SQL*Net**
  - **LPGS does not filter duplicate data**
  - **LPGS deletes "expired" trending data regardless of whether IAS has retrieved it**

LPGS Critical Design Review

Design Philosophy

- Automates L0-to-L1 processing to support unattended operations
- Uses system parameters (“no hardcoding”) to control operations
- Provides manual override capabilities
- Provides an interface to ECS for each product type
  - Product request
  - L0R product
  - L1 product

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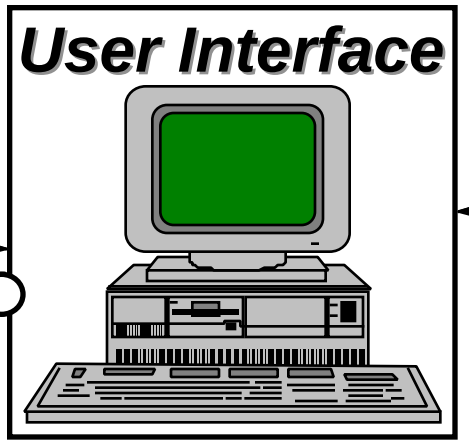
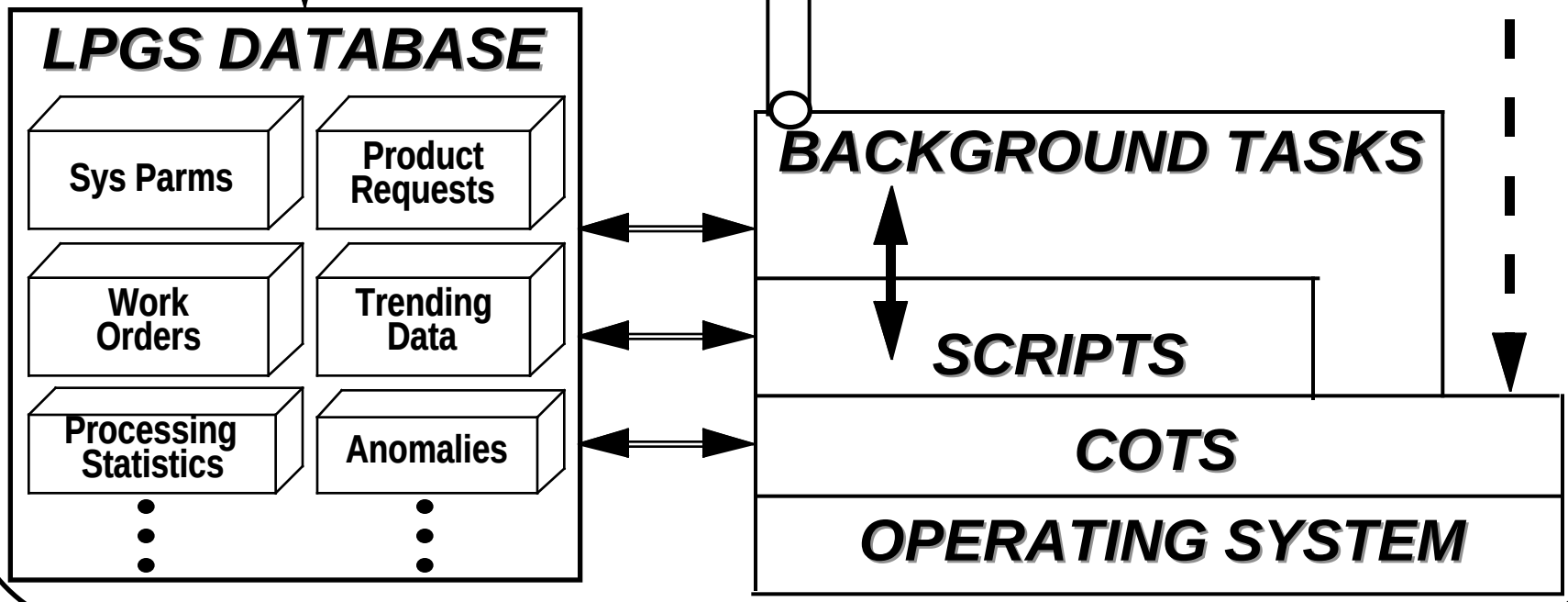
LPGS Critical Design Review

LPGS Software Architecture





LPGS Critical Design Review

LPGS Subsystem Overview

- **Data Management Subsystem (DMS)**
  - **Handles communication with external interfaces**
    - **Ingests L0R product**
    - **Distributes L1 product**
  - **Performs preprocessing of L0R product**
  - **Formats and packages final L1 product**
  - **Monitors and manages LPGS disk space**
- **Process Control Subsystem (PCS)**
  - **Schedules production processing**
  - **Sets up, monitors, and controls production processing**

LPGS Critical Design Review

LPGS Subsystem Overview (Cont'd)

- **Radiometric Processing Subsystem (RPS)**
  - **Performs radiometric characterization and correction**
  - **Reused from IAS**
- **Geometric Processing Subsystem (GPS)**
  - **Creates systematically corrected L1G imagery**
  - **Reused from IAS**

LPGS Critical Design Review

LPGS Subsystem Overview (Cont'd)

- **Quality Assessment Subsystem (QAS)**
  - **Generates and assembles postproduction quality information**
  - **Produces summary of processed image quality**
  - **Provides tools for visual inspection of images**
- **Anomaly Analysis Subsystem (AAS)**
  - **Analyzes L1 images and associated information to resolve production anomalies**
  - **Provides tools for investigating problems encountered during processing or problems reported in trouble tickets**
  - **Provides results of trouble ticket analysis to ECS**
  - **Sends unresolved problems to ECS for further investigation**

LPGS Critical Design Review

LPGS Database

- Evolved from IAS database design
  - Tables added to support LPGS-specific functions
- Maintains data for
  - System parameters
  - Product requests
  - Work orders
  - Trending
  - Quality assessment
  - Anomalies
  - Processing statistics

LPGS Critical Design Review

LPGS COTS Products

- **Analysis/design**
  - **RTM Version 3.5 (Marconi)**
  - **Designer 2000 (Oracle)**
  - **Teamwork Version 6.2 (Cadre)**
- **Software development**
  - **Developer 2000 (SQL*Forms and SQL*Menu) (Oracle)**
  - **Oracle Server (Oracle)**
  - **SQL*Net (Oracle)**
  - **SQL*Plus (Oracle)**
  - **Pro*C (Oracle)**
  - **IDL Version 5.0 (RSI)**
  - **Purify Version 4.0.1 (Pure Software)**

LPGS Critical Design Review

LPGS COTS Products (Cont'd)

- CM tools
  - RPS (Shareware)
  - PVCS (Intersolv)
- Other applications
  - Action Request System (trouble ticket system) (Remedy)
  - TBD for reading, writing, and viewing L1 products

LPGS Critical Design Review

Interprocess Communications

- Oracle pipes provide communication between UI and LPGS background tasks for time critical messages
- Database updates provide primary method of communication between LPGS background tasks when information is not time critical
- UNIX scripts are used to perform all automated work order processing
  - Receive parameter identifying name of input parameter file
  - Return completion status indicating success or failure

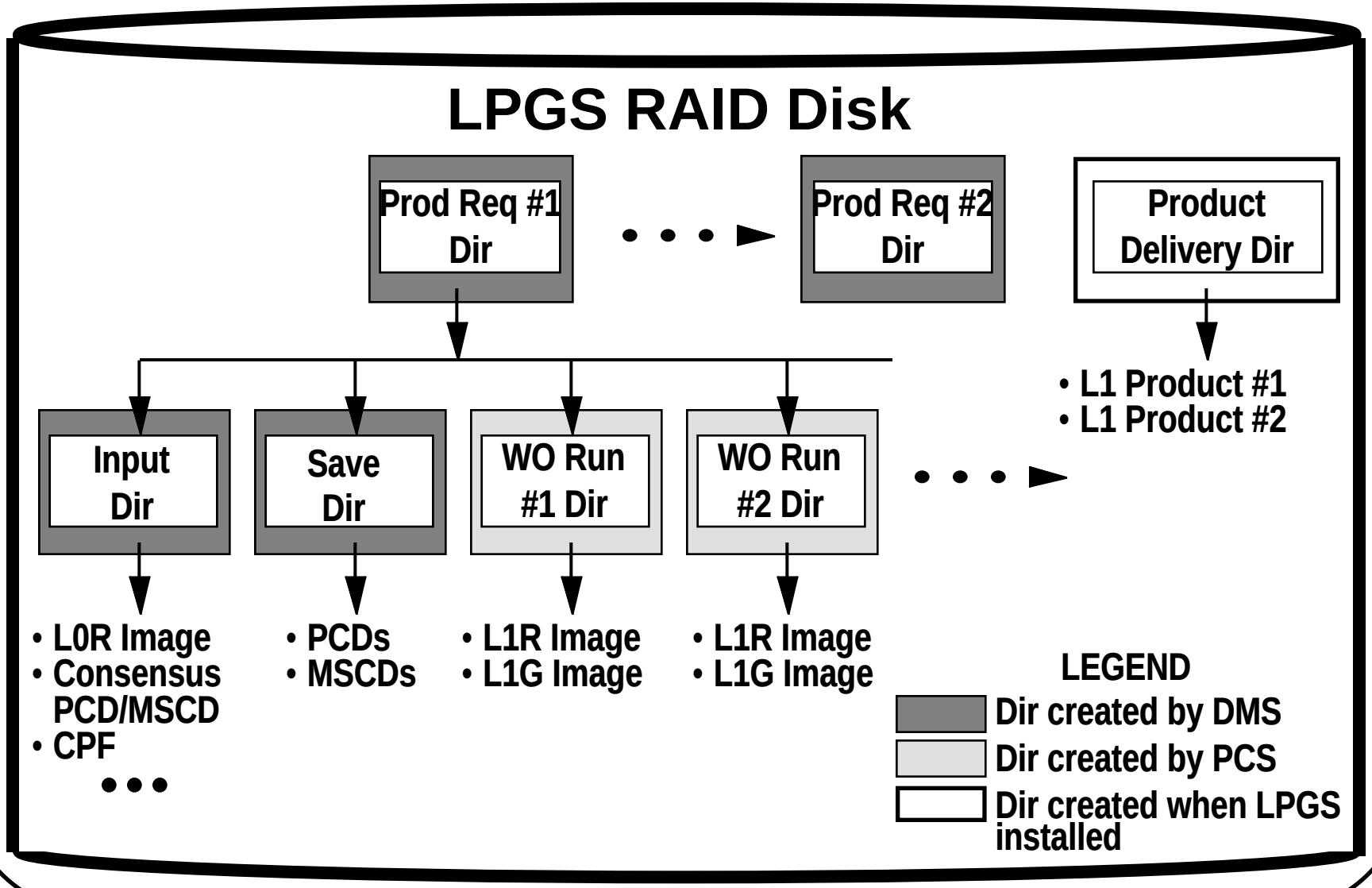
LPGS Critical Design Review

Key Terms

- **Product request (PR)—Request received from ECS to produce an L1 product**
- **Work order (WO)—LPGS internal mechanism used to control the L1 processing for a PR**
- **Relationship between a product request and a work order**
  - **Nominally there is one work order per product request**
  - **If a problem is encountered during processing, analysts may create additional work orders as a part of their investigation**

LPGS Critical Design Review

LPGS Directory Structure



LPGS Critical Design Review

LPGS Logging

- **Event log**
  - **Notifies operator/analyst of significant events**
  - **Maintained in the database**
  - **Viewable from UI screen**
- **Work order log**
  - **Contains information intended for use by AAS analyst**
  - **Used for standard output by work order scripts**
  - **Written to work order directory**
- **System log**
  - **Contains error information needed for investigating software failures**

LPGS Critical Design Review

Software Reuse

- LPGS must maximize software reuse to meet schedule
- IAS reuse
  - Radiometric processing
  - Geometric processing
  - Global utilities
  - Database utilities
  - Initialization/termination task
  - L0R product preprocessing
  - Work order processing
  - Database design
  - UI screens

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LPGS Critical Design Review

End-to-End Scenarios

- Key terms
- LPGS scenarios

LPGS Critical Design Review

Key Terms

- **Product request (PR)—Request received from ECS directing LPGS to generate a specific L1R or L1G product**
- **Work order (WO)—Detailed instructions for L1 processing of a specific product request. A work order is constructed from an ordered list of work order scripts. It also encompasses the parameters associated with each script**
- **Work order script—UNIX script used to run one or more programs as part of work order**
- **Promote—Function that allows LPGS operator to change order of processing from default FIFO order. Promoted requests are processed before other requests**

LPGS Critical Design Review

Key Terms (Cont'd)

- **Trouble ticket—Mechanism for receiving problems from or sending problems to ECS**
- **Background task—Task that is always running and performs functions as required**
- **Trending data—Statistical information collected during L0R preprocessing, radiometric processing, and geometric processing; also referred to as characterization results**
- **Benchmark—Test of LPGS processing using a known good scene as input**

LPGS Critical Design Review

LPGS Scenarios

- System startup
- LPGS/ECS
  - Product request retrieval
  - L0R ingest
  - L1 processing
  - L1 product transfer
  - Product request cancellation
  - Product request promotion
  - Trouble ticket
- LPGS/IAS
  - Retrieval of characterization data
- System shutdown

LPGS Critical Design Review

System Startup Scenario

startup screen

invokes

Initialization Task

invokes

Background Tasks

reads task list

LPGS Database

Tasks Table

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LPGS Critical Design Review

Product Request Retrieval Scenario

QAS Analyst

PCS

DMS

Detects L1 product request & retrieves it

Validates request & sends response

Stores product request in database

ECS

Stores L1 product request on its server

Receives L1 product request response

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LPGS Critical Design Review

L0R Ingest Scenario

QAS Analyst

PCS

DMS

Detects product request that needs data

Sends request for L0R data via socket interface

ECS

Receives request & stages product on its server

Sends notification that data are available

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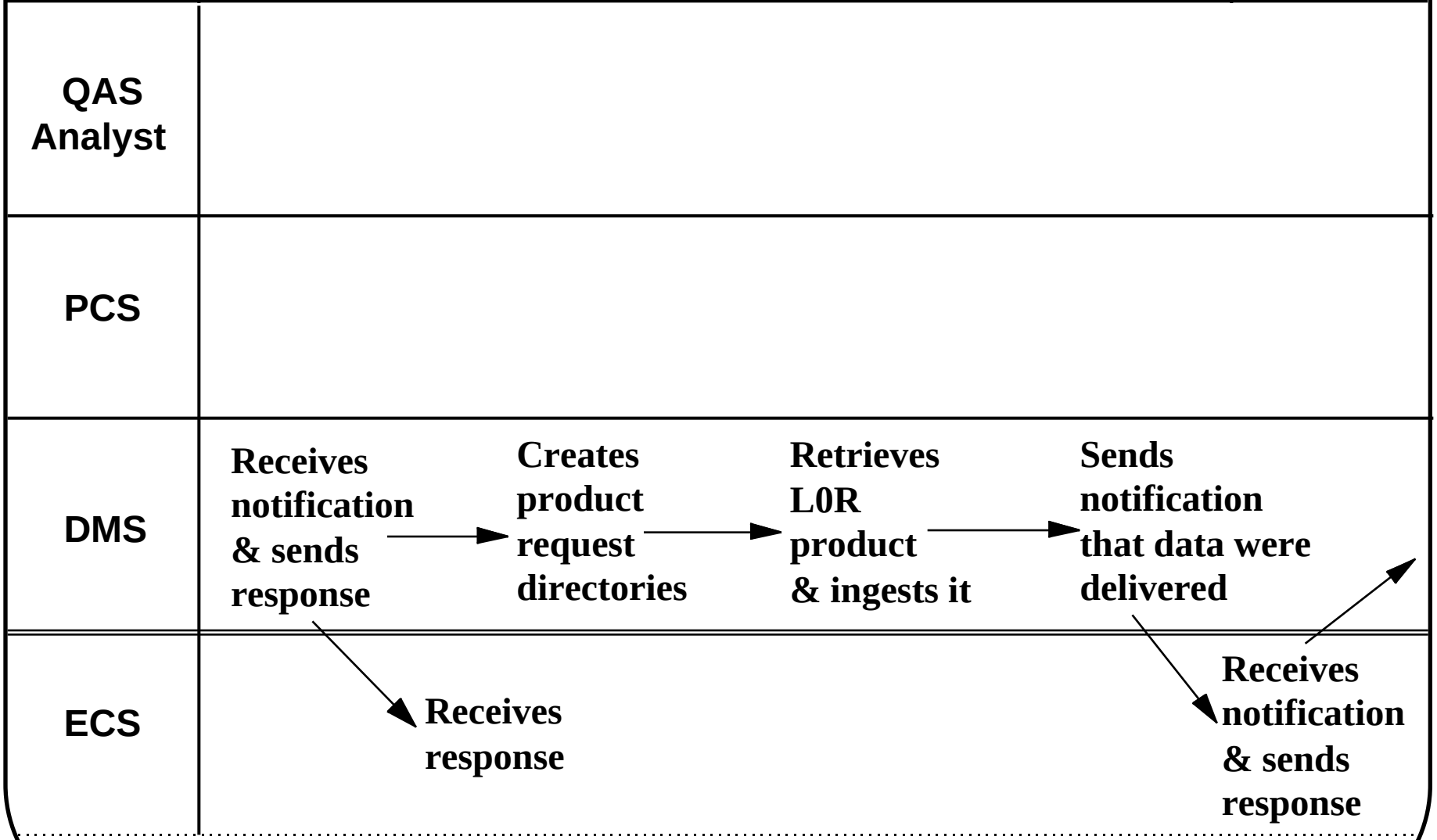
LPGS Critical Design Review

L0R Ingest Scenario (Cont'd)



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LPGS Critical Design Review

L0R Ingest Scenario (Cont'd)

QAS Analyst

PCS

DMS

Receives response

Updates database to show data are available

ECS

LPGS Critical Design Review

L1 Processing Scenario Assumptions

- **L1 processing scenario assumes**
  - **Generation of L1G product was requested**
  - **Visual assessments of product image quality were made after both L1R and L1G processing and after formatting of output product**
  - **Output product passes all visual quality assessments**

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LPGS Critical Design Review

L1 Processing Scenario

QAS Analyst

PCS

Detects new product request for which L0R data are available → **Generates WO & creates WO directory** →

DMS

ECS

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LPGS Critical Design Review

L1 Processing Scenario (Cont'd)

QAS Analyst			Performs visual assessment of L1R image	→
PCS	→	Starts WO processing with execution of Script Set 1	Builds visual assessment notification for L1R image	
DMS				

- Script Set 1
  - Generate L0R quality statistics (DMS)
  - Perform radiometric characterization and corrections (RPS)
  - Perform automated quality assessment of L1R image (QAS)

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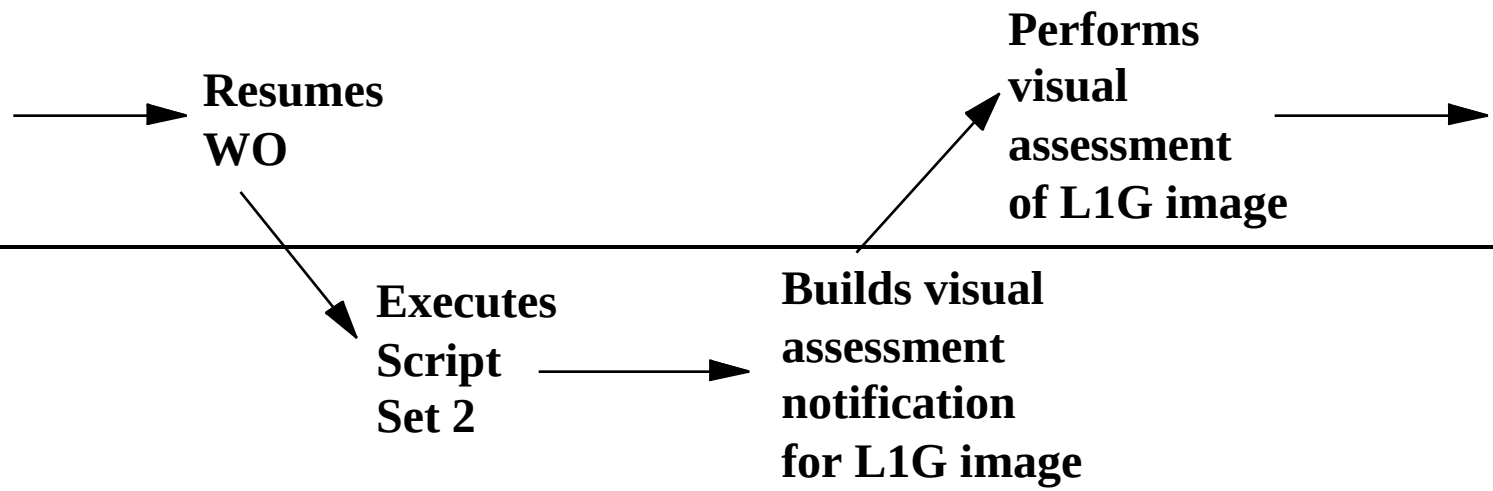
LPGS Critical Design Review

L1 Processing Scenario (Cont'd)



- **Script Set 2**
  - **Perform geometric corrections (GPS)**
  - **Perform automated quality assessment of L1G image (QAS)**

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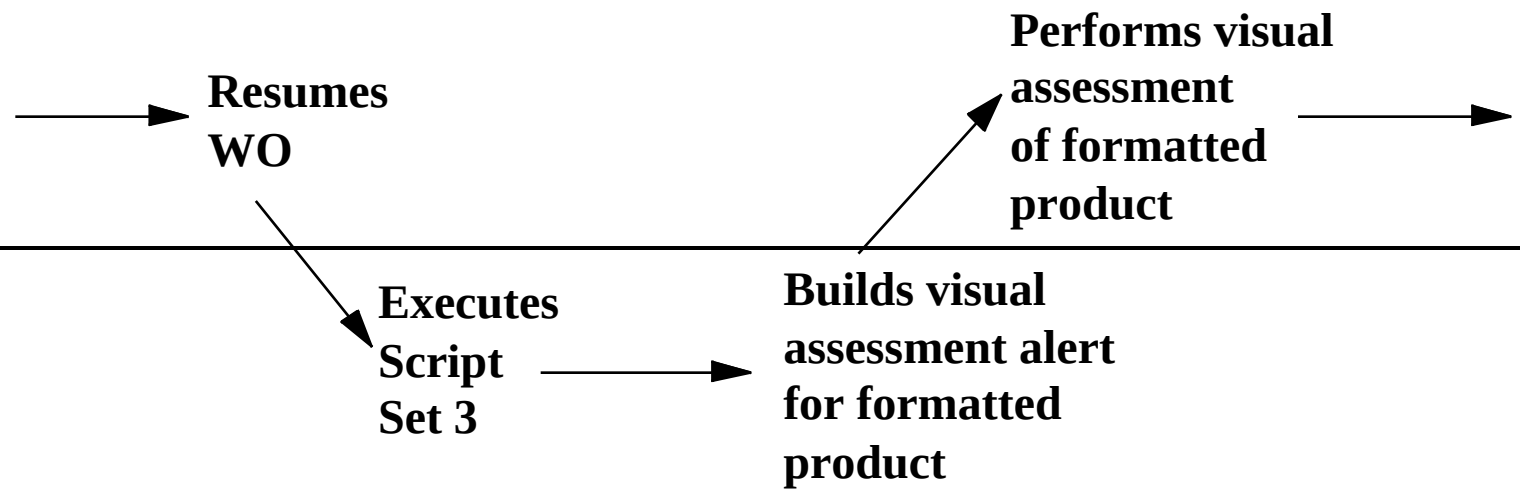
LPGS Critical Design Review

L1 Processing Scenario (Cont'd)



- Script Set 3
  - Format and package L1 product and check it for completeness (DMS)

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LPGS Critical Design Review

L1 Processing Scenario (Cont'd)

QAS Analyst	Resumes WO
PCS	Updates database to indicate that L1 product is ready for transfer
DMS	
ECS	

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LPGS Critical Design Review

L1 Product Transfer Scenario

QAS Analyst

PCS

DMS

Detects product ready for transfer → **Sends notification that product is available**

ECS

Receives notification & validates it → **Retrieves L1 product & performs ingest** →

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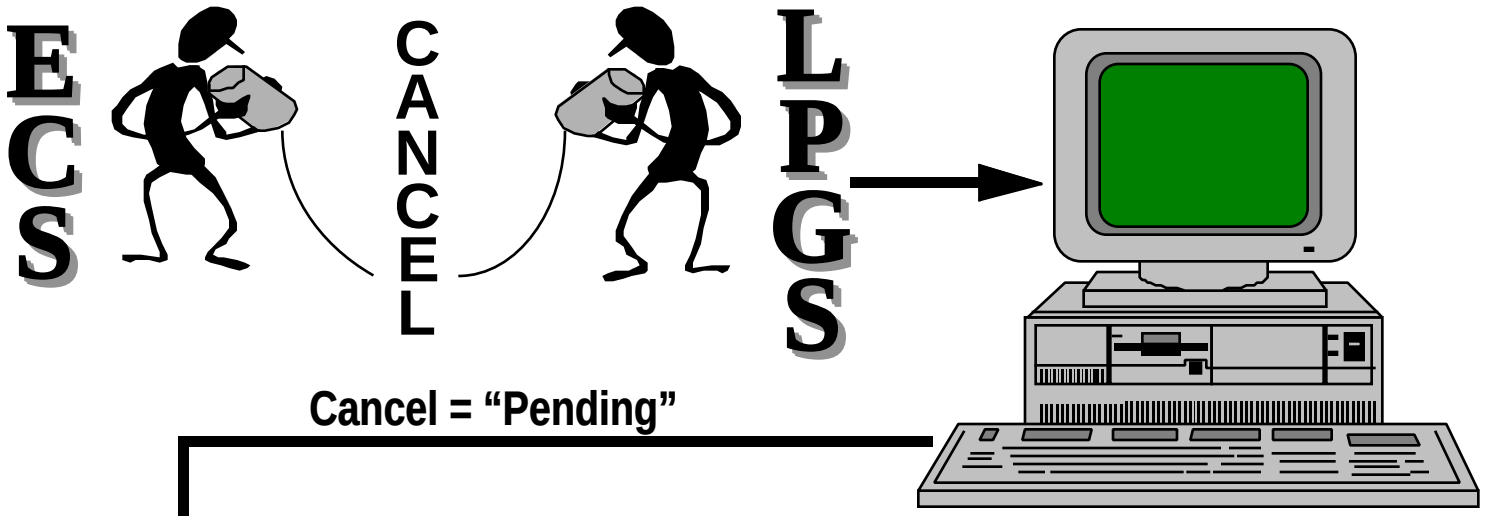
LPGS Critical Design Review

L1 Product Transfer Scenario (Cont'd)

QAS Analyst	
PCS	
DMS	Receives notification & validates it → Marks product request directories as deletable → Marks product request as complete
ECS	Sends notification that product was received

LPGS Critical Design Review

Product Request Cancellation Scenario



Cancel = “Pending”

LPGS Database

Cancel ?= “Pending”

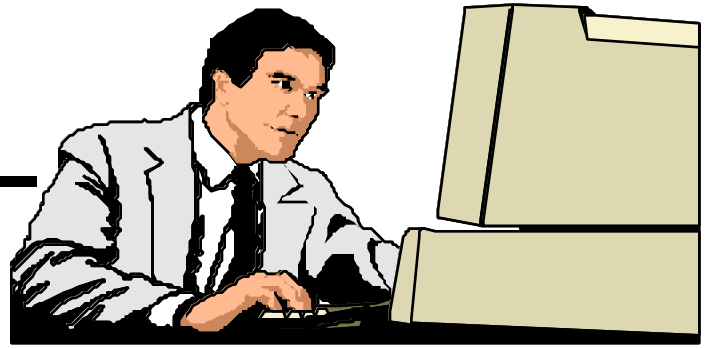
PR = “Deletable”
Cancel = “Done”

Cancellation Checks

- Before sending L0R request
- Before retrieving L0R data
- Before generating WO
- Before scheduling WO
- Before resuming WO
- Before starting scripts

LPGS Critical Design Review

Product Request Promotion Scenario



Promoted = “True”

LPGS Database

Promoted request?

Promotion Checks

- Before sending L0R request
- Before generating WO
- Before scheduling WO

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LPGS Critical Design Review

Trouble Ticket Scenario

ECS Trouble Ticket System

- Retrieve trouble ticket
- Update trouble ticket with resolution

AAS User Interface

- Access ECS trouble ticket system to retrieve trouble ticket
- Add trouble ticket to anomalies table
- ftp returned product from ECS
- View returned image and metadata
- Attempt to recreate problem
- Access ECS trouble ticket system to update trouble ticket information, denoting how problem was resolved or indicating that LPGS was unable to resolve problem

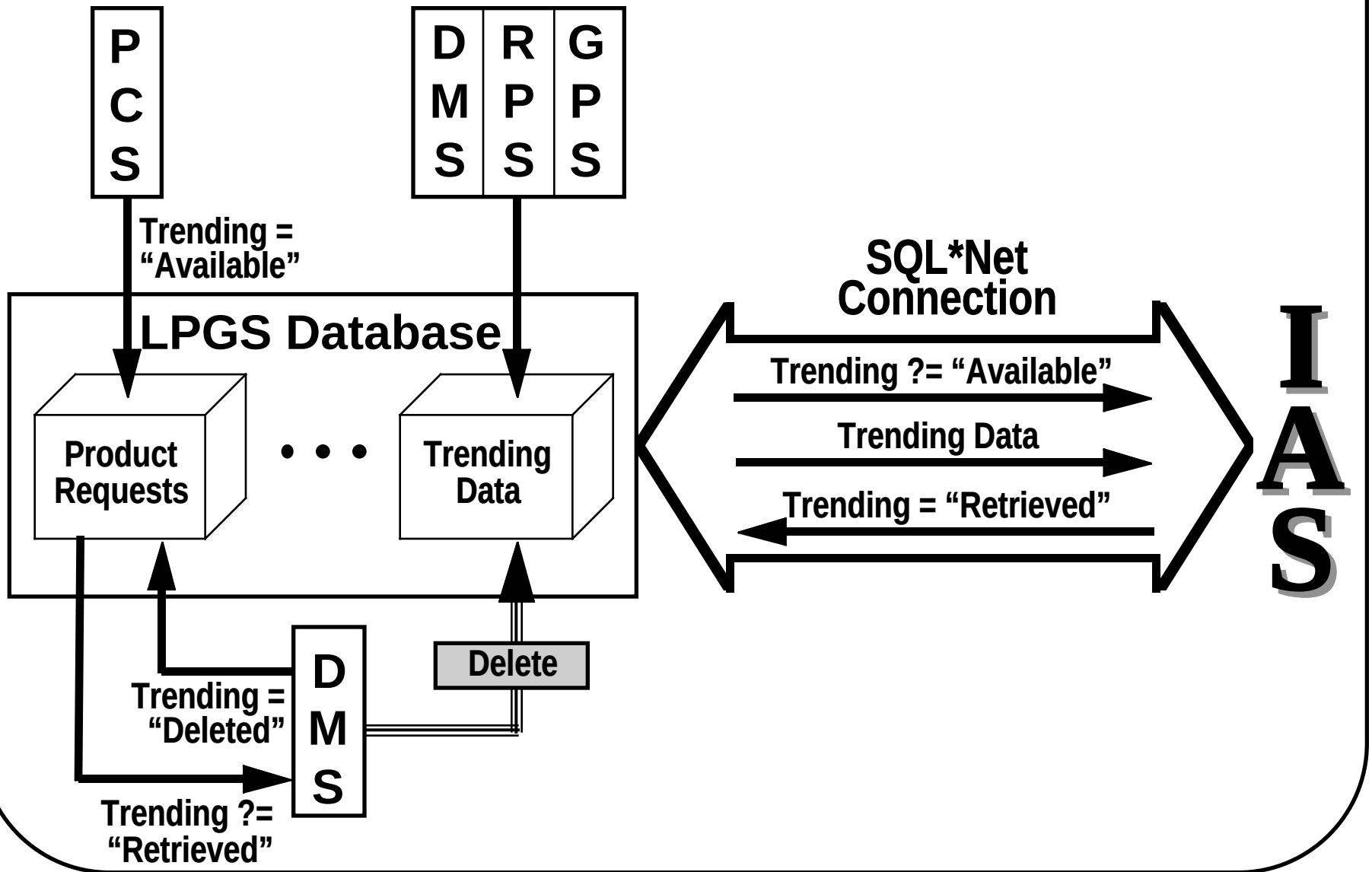
LPGS Background Tasks

- Perform requested tasks

LPGS Analyst

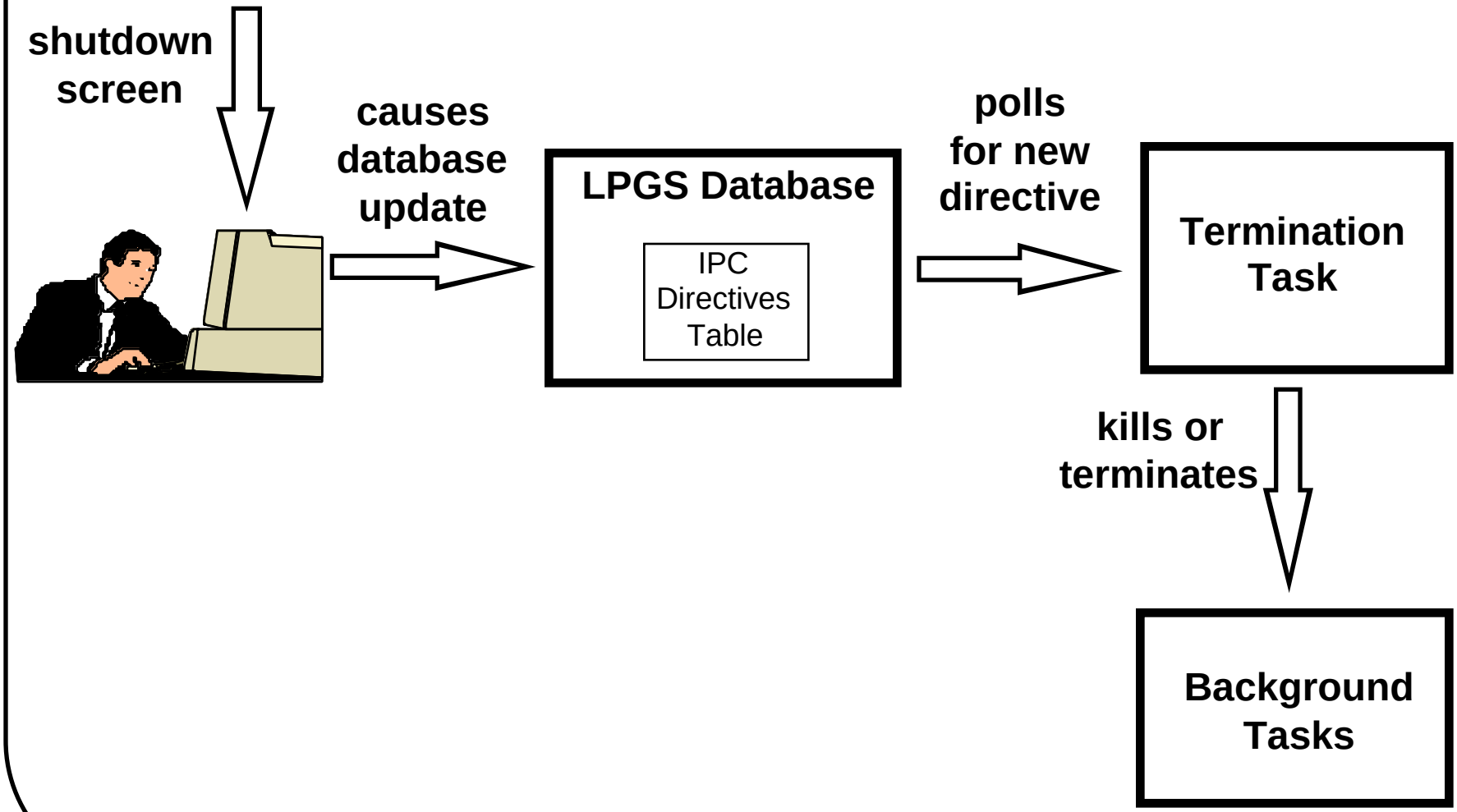
LPGS Critical Design Review

IAS Retrieval of Characterization Data Scenario



LPGS Critical Design Review

System Shutdown Scenario



LPGS Critical Design Review

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LPGS Critical Design Review

User Interface

- Purpose
- Philosophy
- Roles and functions
- Main menu
- Pulldown menus and screens

LPGS Critical Design Review

UI Purpose

- **Provides means to perform**
  - **System parameter adjustments**
  - **Event log viewing**
  - **Cancellation**
  - **Promotion**
  - **Anomaly investigation**
  - **Visual assessment**

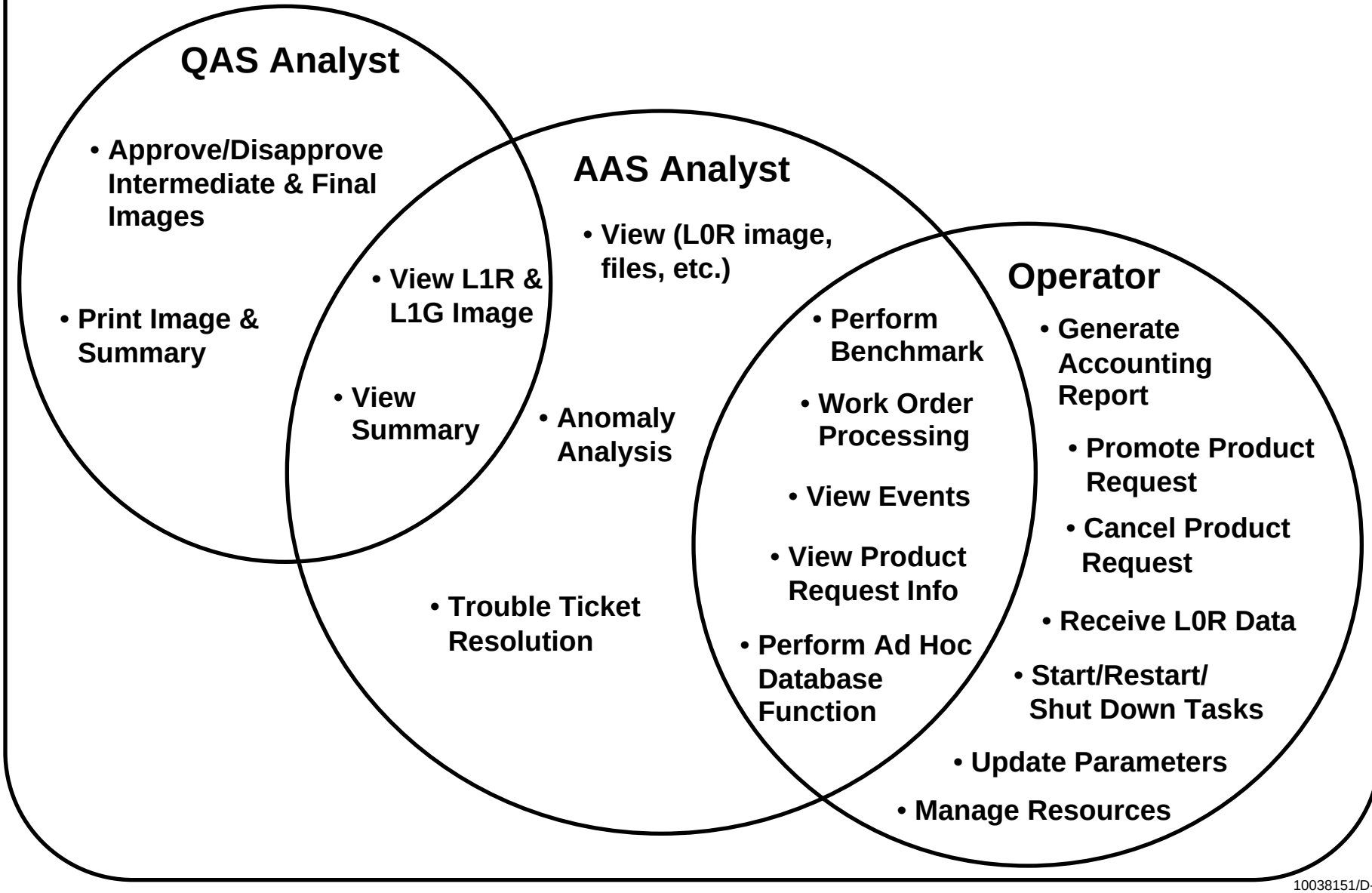
LPGS Critical Design Review

UI Philosophy

- All screens are built using Oracle Forms except screens used for viewing images (images are displayed using other COTS packages)
- UI communicates with background tasks via
  - Database (example: cancellations)
  - Oracle pipes (example: disk cleanup)
- UI is identical for both operator and analyst for a common look and feel

LPGS Critical Design Review

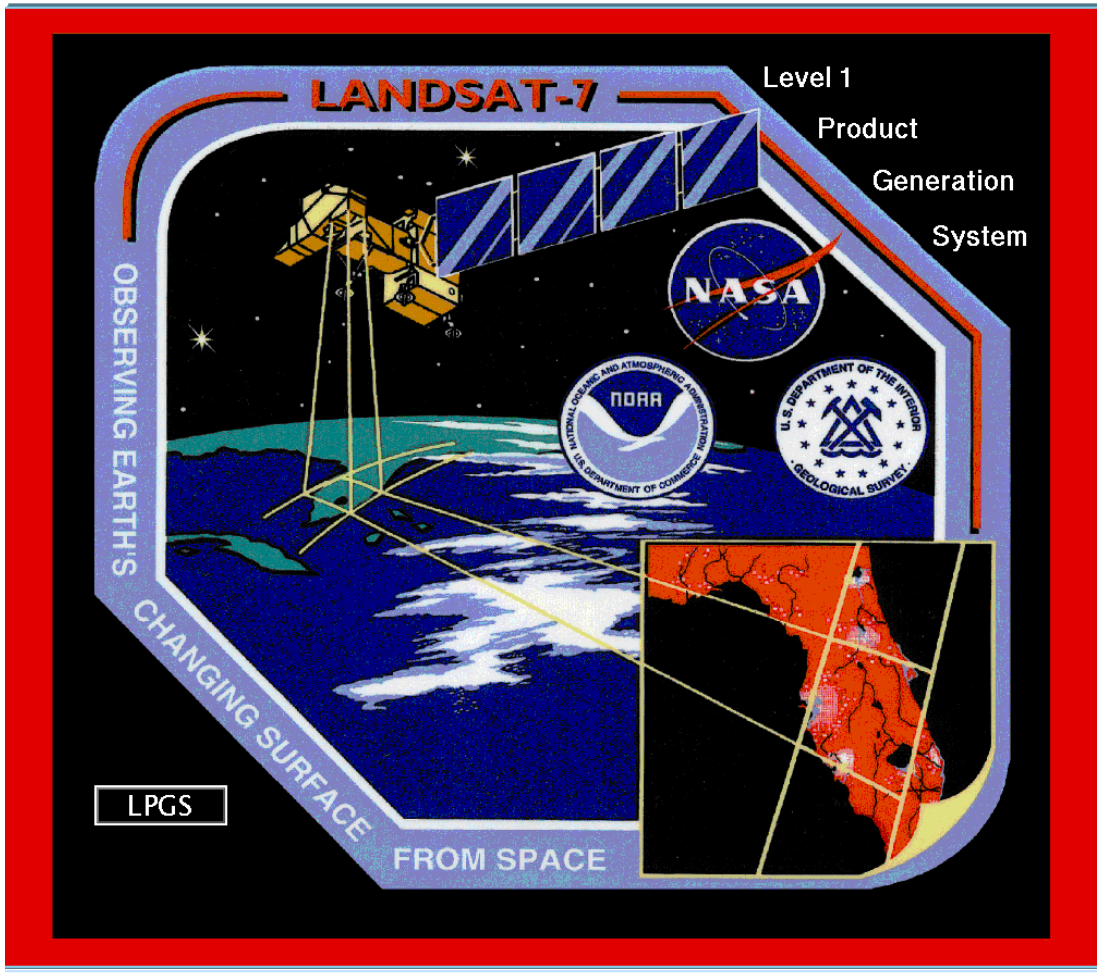
Roles and Functions



LPGS Critical Design Review

LPGS UI Main Menu

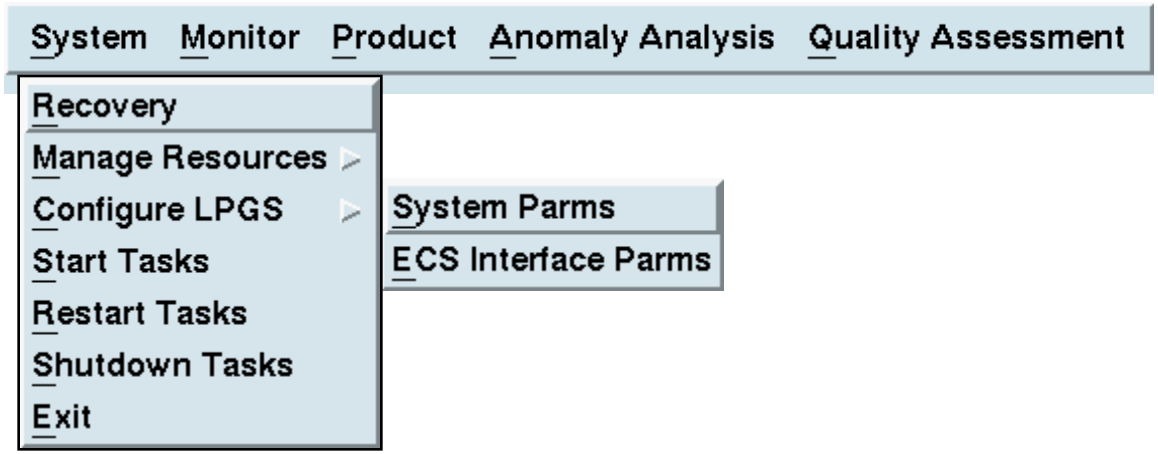
System Monitor Product Anomaly Analysis Quality Assessment



Count: *0 <Insert>

LPGS Critical Design Review

UI System Pulldown Menu



LPGS Critical Design Review

UI System/Configure LPGS/System Parms Option Screen

System Monitor Product Anomaly Analysis Quality Assessment

SET UP LPGS CONFIGURATION PARAMETERS

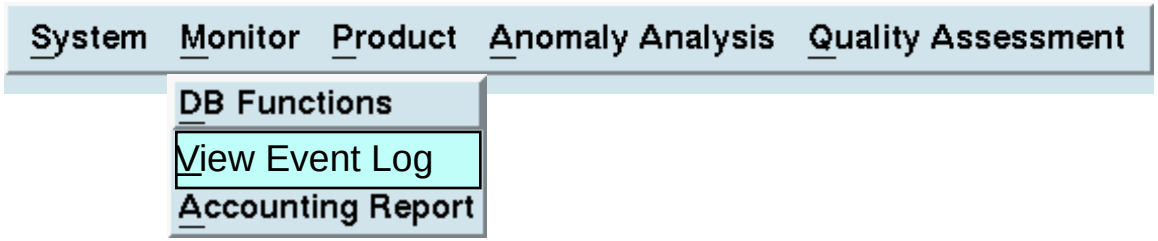
RAID First Advisory Limit	65	%
RAID Second Advisory Limit	85	%
Max Concurrent Work Orders	5	
Work Order Scheduler Interval	101	sec
Work Order Controller Interval	300	sec
Resource Monitor Interval	300	sec
Deletion Interval	300	sec
Check Disk Interval	300	sec
PSI Polling Interval	300	sec
File Transfer Polling Interval	100	sec
DAN Polling Interval	10	sec

OK CANCEL

Count: *1 <Insert>

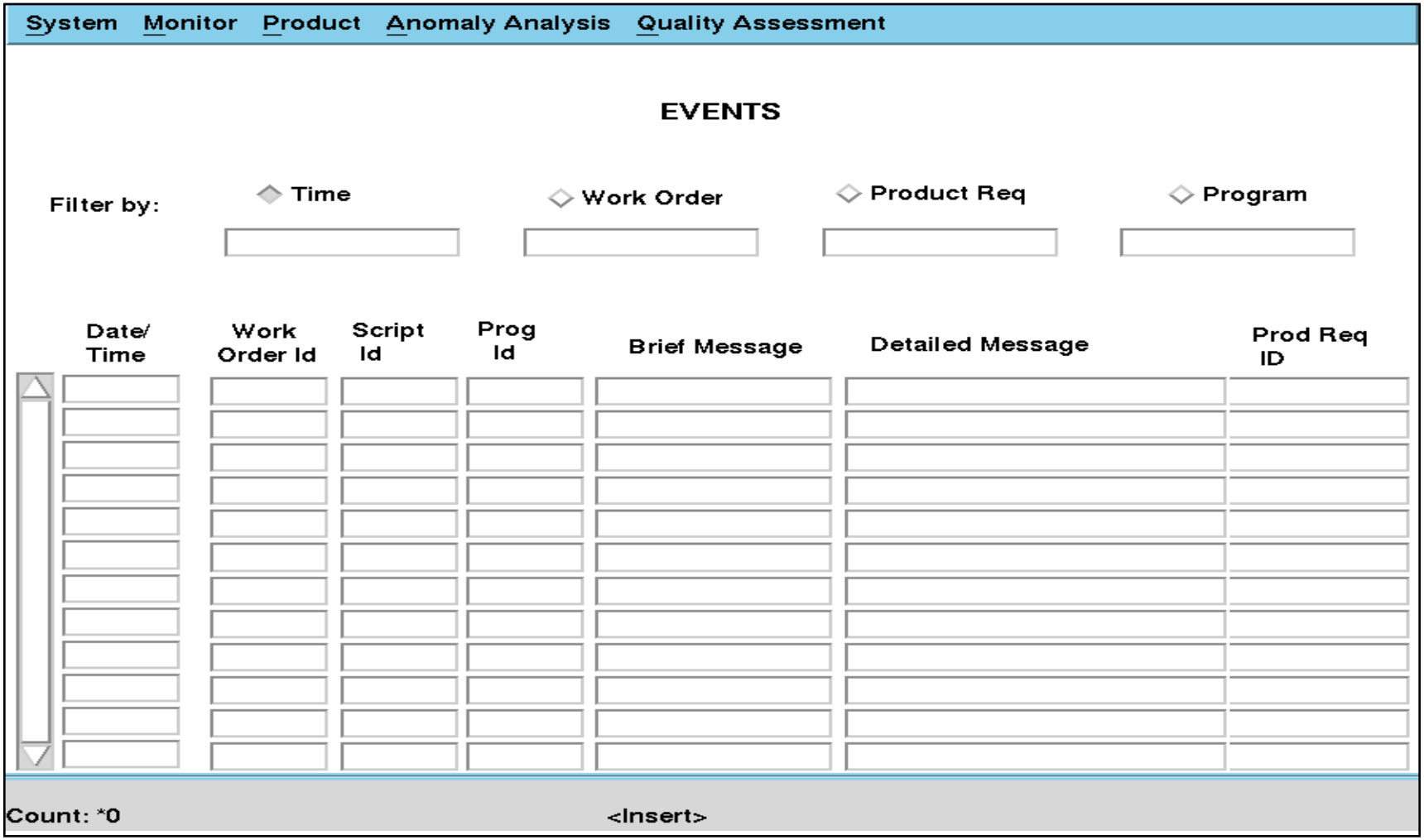
LPGS Critical Design Review

UI Monitor Pulldown Menu



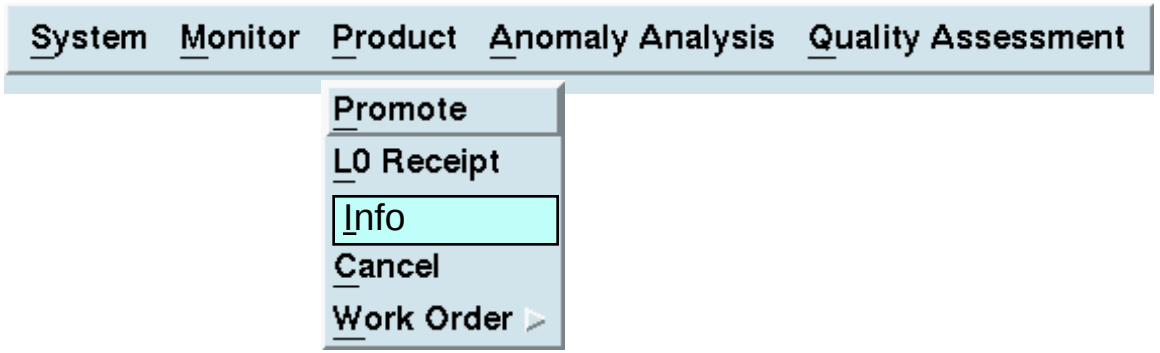
LPGS Critical Design Review

UI Monitor/View Event Log Option Screen



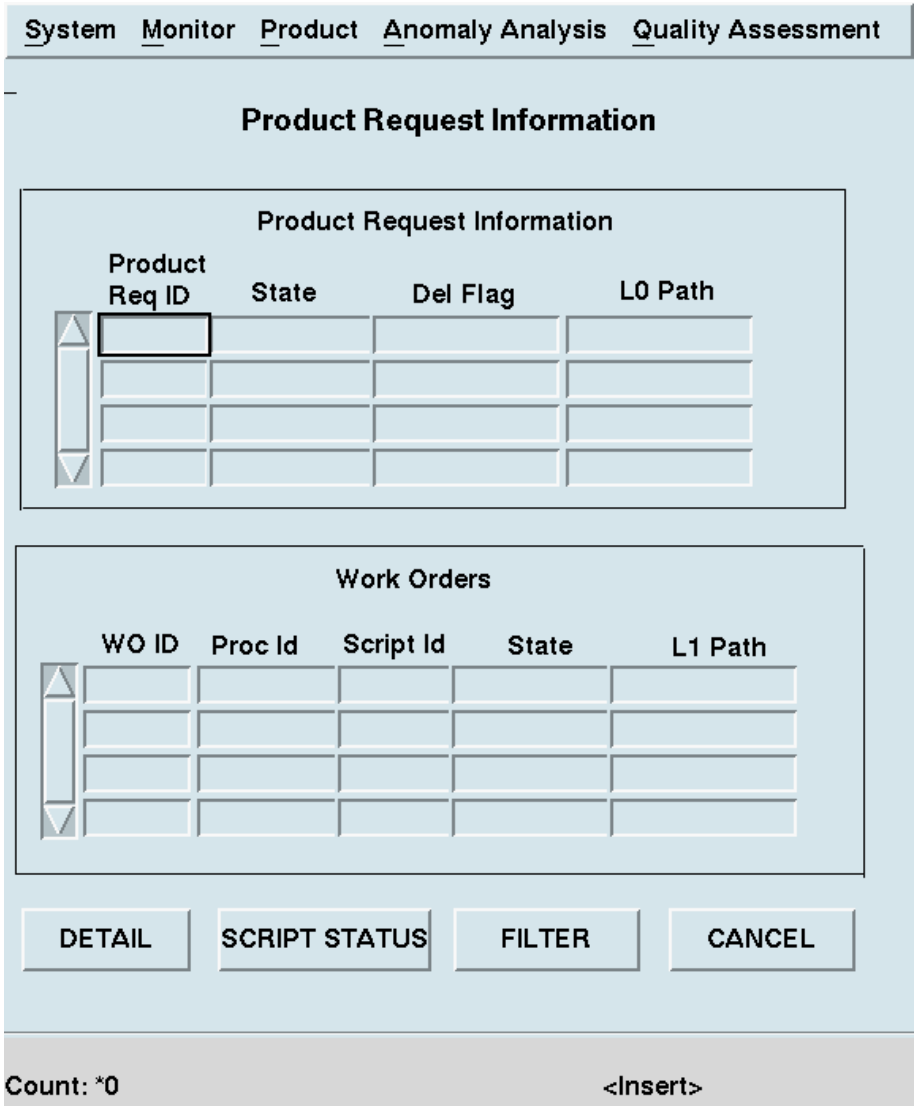
LPGS Critical Design Review

UI Product Pulldown Menu



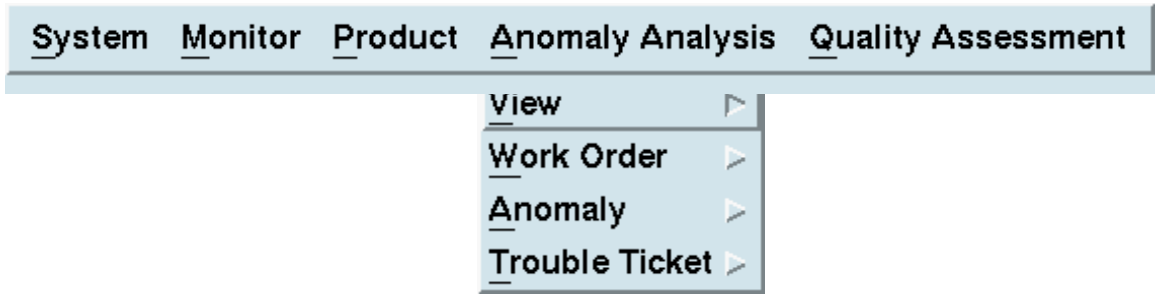
LPGS Critical Design Review

UI Product/Info Option Screen



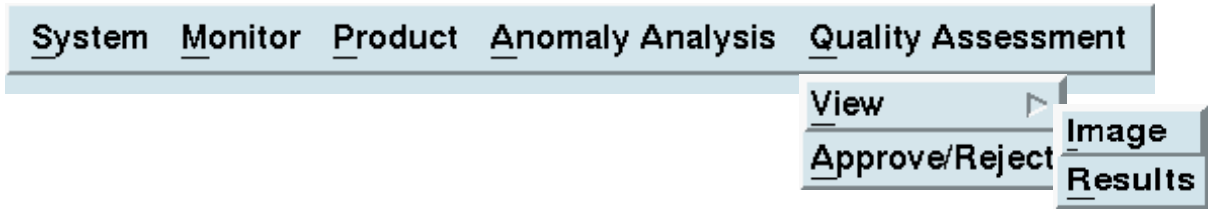
LPGS Critical Design Review

UI Anomaly Analysis Pulldown Menu



LPGS Critical Design Review

UI Quality Assessment Pulldown Menu



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LPGS Critical Design Review

Data Management Subsystem

- Purpose
- Context diagram
- Design assumptions
- Design decisions
- Disk management policy
- Tasks
- Task model
- Task descriptions
- Operator-specifiable parameters
- Software architecture
- Open issues

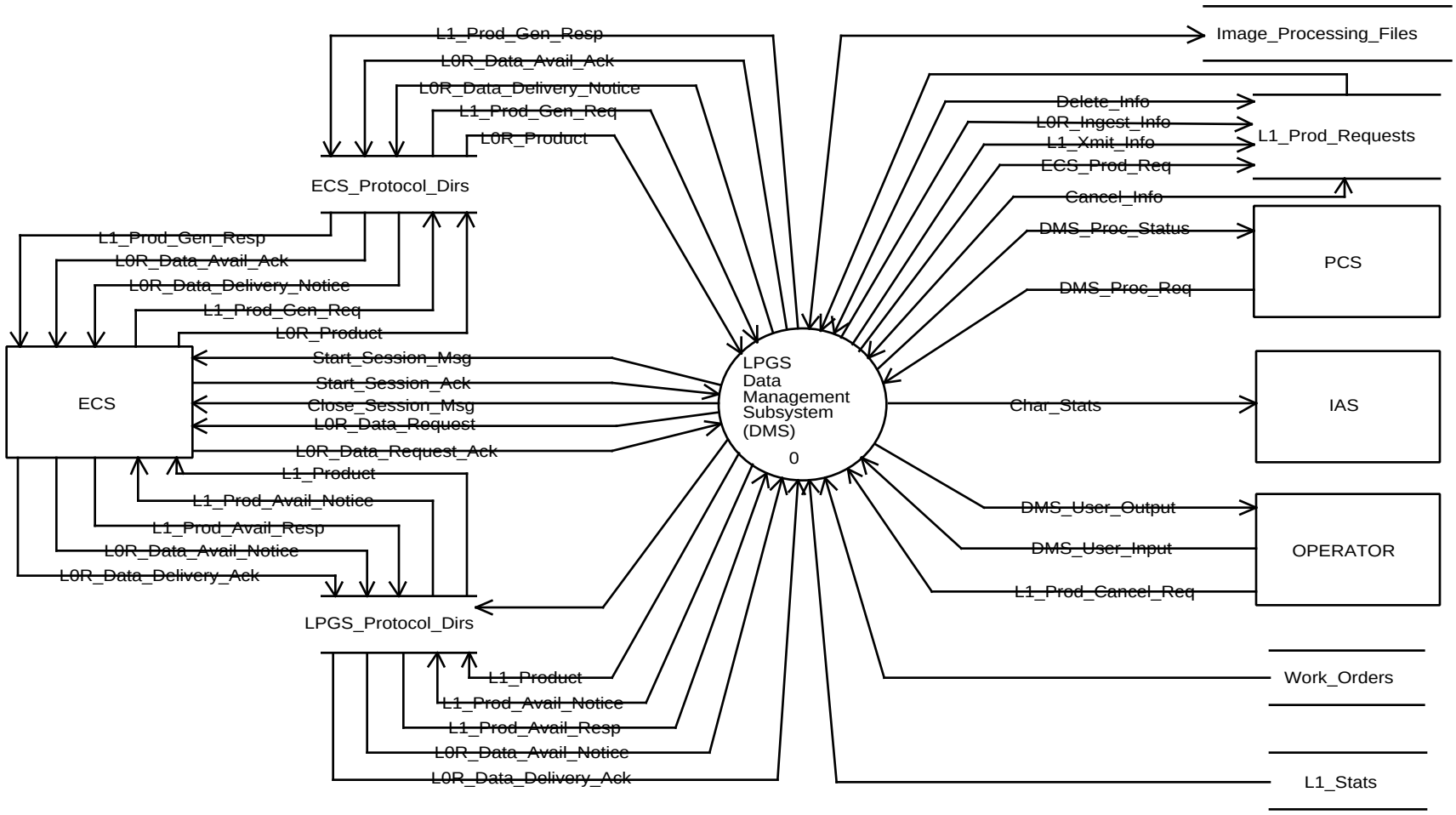
LPGS Critical Design Review

DMS Purpose

- Manages ECS electronic interface
  - Retrieves product requests
  - Acquires L0 products
  - Notifies ECS when L1 products are ready
- Manages IAS electronic interface
  - Deletes trending data after IAS retrieval
  - Deletes expired trending data after operator-specified number of days
- Unpacks and verifies ingested L0R products
- Formats and packages L1 products
- Manages disk space
  - Creates directories
  - Deletes files and directories
- Generates processing statistic report

LPGS Critical Design Review

DMS Context Diagram



LPGS Critical Design Review

DMS Design Assumptions

- Uses “Concepts for ECS/LPGS Interface” for the design
  - Based on memo dated June 6th
  - ECS provides the product requests “just in time”
  - Protocol files on LPGS disk deleted by LPGS
- Assumes, for IAS interface, that
  - IAS connects to LPGS via network
  - IAS retrieves trending data from LPGS database
  - IAS marks trending data for deletion
  - DMS deletes marked and expired trending data from database

LPGS Critical Design Review

DMS Design Decisions

- **Uses COTS products to**
  - **Convert L1 products to HDF-EOS format**
  - **Convert L1G image to GeoTIFF and FAST-C formats**
  - **ftp files and poll directories**
  - **Read and write files in ODL/PVL format**
  - **Access database**

LPGS Critical Design Review

DMS Disk Management Policy

- **Automatic cleanup by background tasks**
  - **Product request files and directories**
    - **Deleted at operator-specified interval if marked for deletion**
    - **Marked for deletion after**
      - **L1 product successfully retrieved by ECS**
      - **Cancellation completed**
      - **Anomaly analysis completed**
  - **Trending data stored in LPGS database**
    - **Deleted at operator-specified interval after retrieval by IAS**
    - **Deleted if older than operator-specified time period even if not retrieved by IAS**
  - **ECS communication protocol files deleted by appropriate tasks**

LPGS Critical Design Review

DMS Disk Management Policy (Cont'd)

- **Operator intervention**
  - **Specify interval for**
    - **Disk cleanup**
    - **Trending data deletion**
    - **Trending data retention**
  - **Delete product request files and directories after L1 processing completes via Delete Image Files screen**
  - **Delete trending data after L1 processing completes via Delete Trending screen**
- **Operator responsibility**
  - **Archive database data older than 90 days**
    - **Export from database**
    - **Save to tape or RAID disk**
  - **Delete all other files, directories, and data on system disk and RAID disks**

LPGS Critical Design Review

DMS Tasks

- DMS consists of 7 tasks
  - Interface with ECS (DIE)
  - Ingest L0R Product (DIL)
  - Xmit L1 Product (DXL)
  - Process L0R Product (DPL)
  - Format L1 Product (DFL)
  - Generate Reports (DGR)
  - Resource Manager (DRM)

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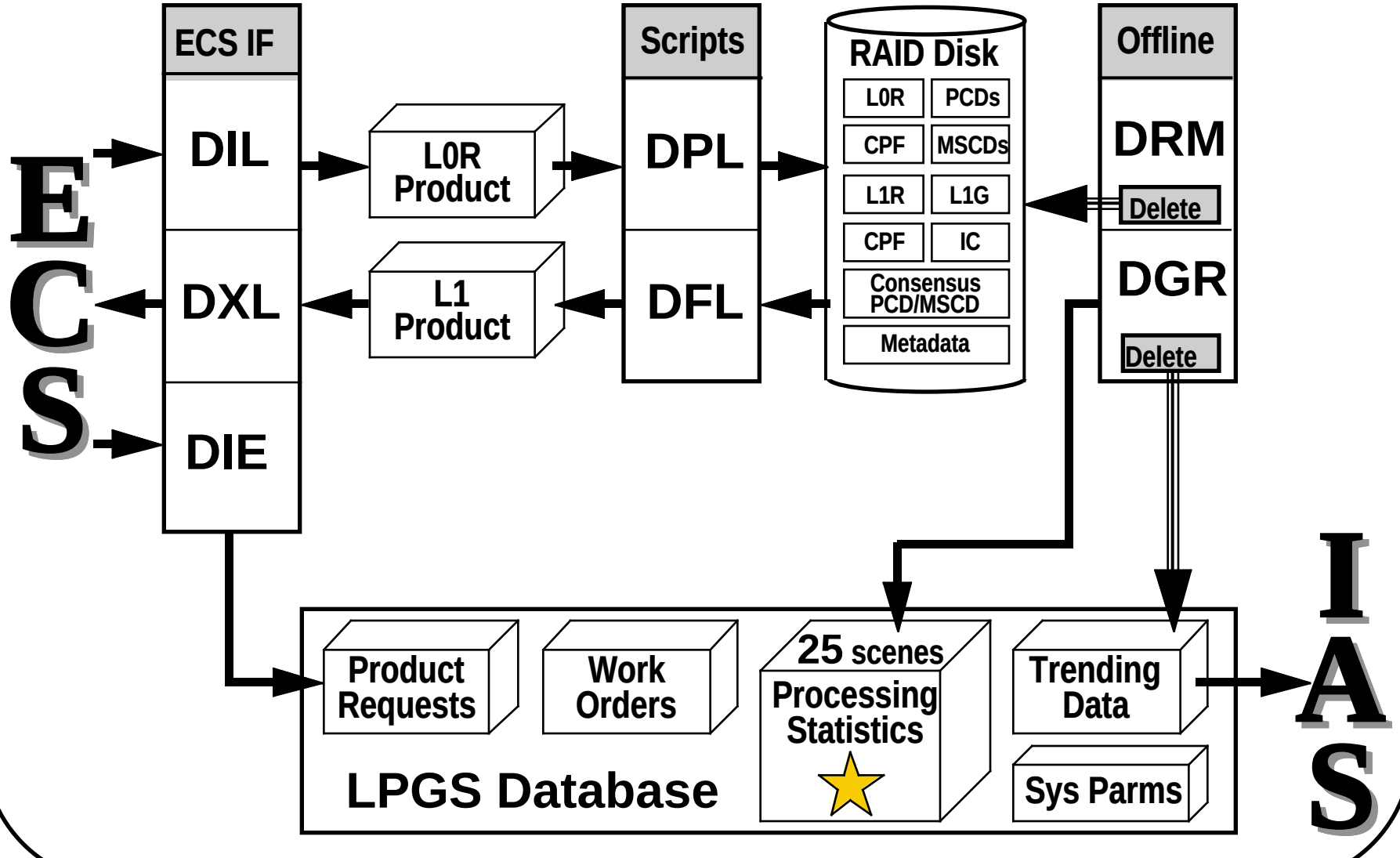
LPGS Critical Design Review

DMS Task Model



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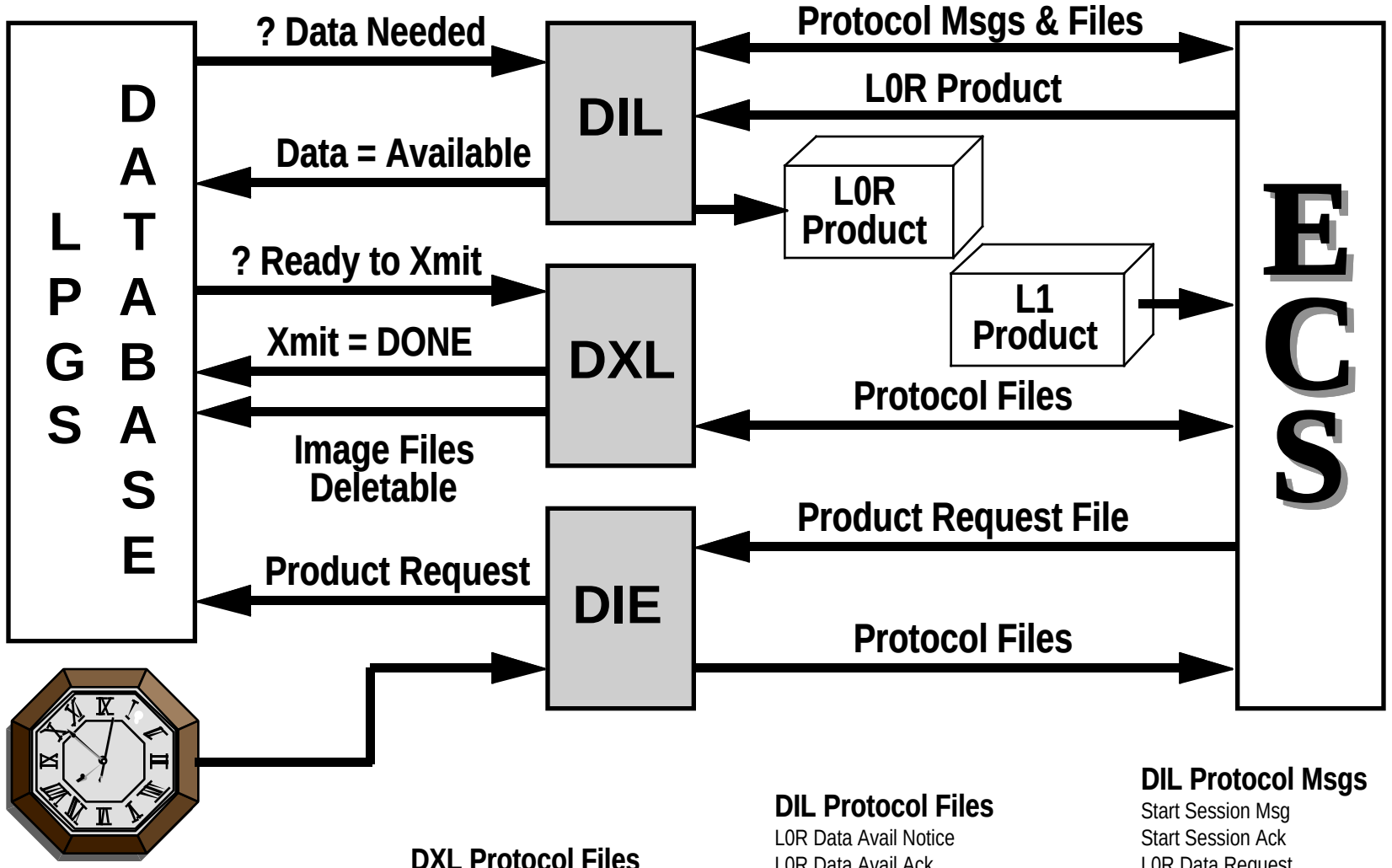
LPGS Critical Design Review

DMS ECS Interface Tasks



DIE Protocol Files
Product Response

DXL Protocol Files
L1 Product Avail Notice
L1 Product Avail Resp

DIL Protocol Files
L0R Data Avail Notice
L0R Data Avail Ack
L0R Data Delivery Notice
L0R Data Delivery Ack

DIL Protocol Msgs
Start Session Msg
Start Session Ack
L0R Data Request
L0R Data Request Ack
Close Session Msg

LPGS Critical Design Review

DMS Interface With ECS (DIE)

- **Purpose**
  - **Receives product requests “just in time”**
  - **Processes product requests**
- **Invocation**
  - **Started by PCS initialization task**
  - **Runs in background**
- **Inputs**
  - **Product request protocol file from ECS**
  - **Operator-modifiable parameters that control**
    - **ECS interface**
    - **Polling interval for product requests**
- **Outputs**
  - **Product request stored in database**
  - **Protocol file indicating status of product request**

LPGS Critical Design Review

DMS Interface With ECS (DIE) (Cont'd)

- **Initialization**
  - **Connects to database**
  - **Sets up product request polling timer**
  - **Checks for "new" product requests**
- **Normal operations**
  - **Periodically polls ECS for new requests**
  - **Pulls product request file via ftp**
  - **Validates product request**
  - **Stores product request in database**
  - **Pushes product response protocol file to ECS via ftp**
- **Termination**
  - **Receives shutdown message from PCS termination task**
  - **Disconnects from database**

LPGS Critical Design Review

DMS Ingest L0R Product (DIL)

- **Purpose**
  - **Ingests L0R product from ECS automatically**
  - **Provides means for manual ingest via L0R Receipt screen**
  - **Processes cancellation requests**
- **Invocation**
  - **Started by PCS initialization task**
  - **Runs in background**
- **Inputs**
  - **Product request state indicating whether data are needed**
  - **L0R product from ECS transferred via ftp**
  - **Protocol messages and files received from ECS**

LPGS Critical Design Review

DMS Ingest L0R Product (DIL) (Cont'd)

- **Inputs (cont'd)**
  - **Operator-modifiable parameters that control**
    - **Ingest criteria**
    - **Processing timers**
    - **ECS interface**
  - **Operator request to acknowledge manually ingested L0R data**
- **Outputs**
  - **L0R product saved to RAID disk**
  - **Protocol messages and files transmitted to ECS**
  - **Product request state updated to indicate L0R data are available**
  - **Catalog of L0R products stored in database**
- **Initialization**
  - **Connects to database**
  - **Checks for next product request requiring L0R data**

LPGS Critical Design Review

DMS Ingest L0R Product (DIL) (Cont'd)

- **Normal operations**
  - **Checks ingest criteria periodically, for example,**
    - **Availability of disk space**
    - **Prestaging time period**
    - **Preventing overload of ECS**
  - **Sends ECS L0R product request**
  - **Receives notice when L0R product is available**
    - **Creates product request, input, and save directories**
    - **Retrieves L0R product into appropriate directory via ftp**
    - **Checks product for completeness and consistency with request**
    - **Catalogs L0R product in database**
    - **Notifies ECS after product is transferred**

LPGS Critical Design Review

DMS Ingest L0R Product (DIL) (Cont'd)

- **Normal operations (cont'd)**
  - **Supports cancellation**
    - **Checks whether cancellation is pending before**
      - **Sending L0R data request to ECS**
      - **Transferring L0R data from ECS**
    - **Marks product request files and directories for deletion**
    - **Updates database to indicate cancellation complete**
- **Termination**
  - **Receives shutdown message from PCS termination task**
  - **Disconnects from database**

LPGS Critical Design Review

DMS Xmit L1 Product (DXL)

- **Purpose**
  - **Notifies ECS when L1 product is ready for transfer**
- **Invocation**
  - **Started by PCS initialization task**
  - **Runs in background**
- **Inputs**
  - **Product request state indicating whether data are ready for transmission**
  - **Protocol files from ECS**
  - **Operator-modifiable parameters that control**
    - **Processing timers**
    - **ECS interface**

LPGS Critical Design Review

DMS Xmit L1 Product (DXL) (Cont'd)

- **Outputs**
  - **Protocol files to ECS**
  - **Product request state updated indicating L1 product transfer status**
  - **Product request associated files and directories marked for deletion**
- **Initialization**
  - **Connects to database**
  - **Checks for product requests requiring transfer**

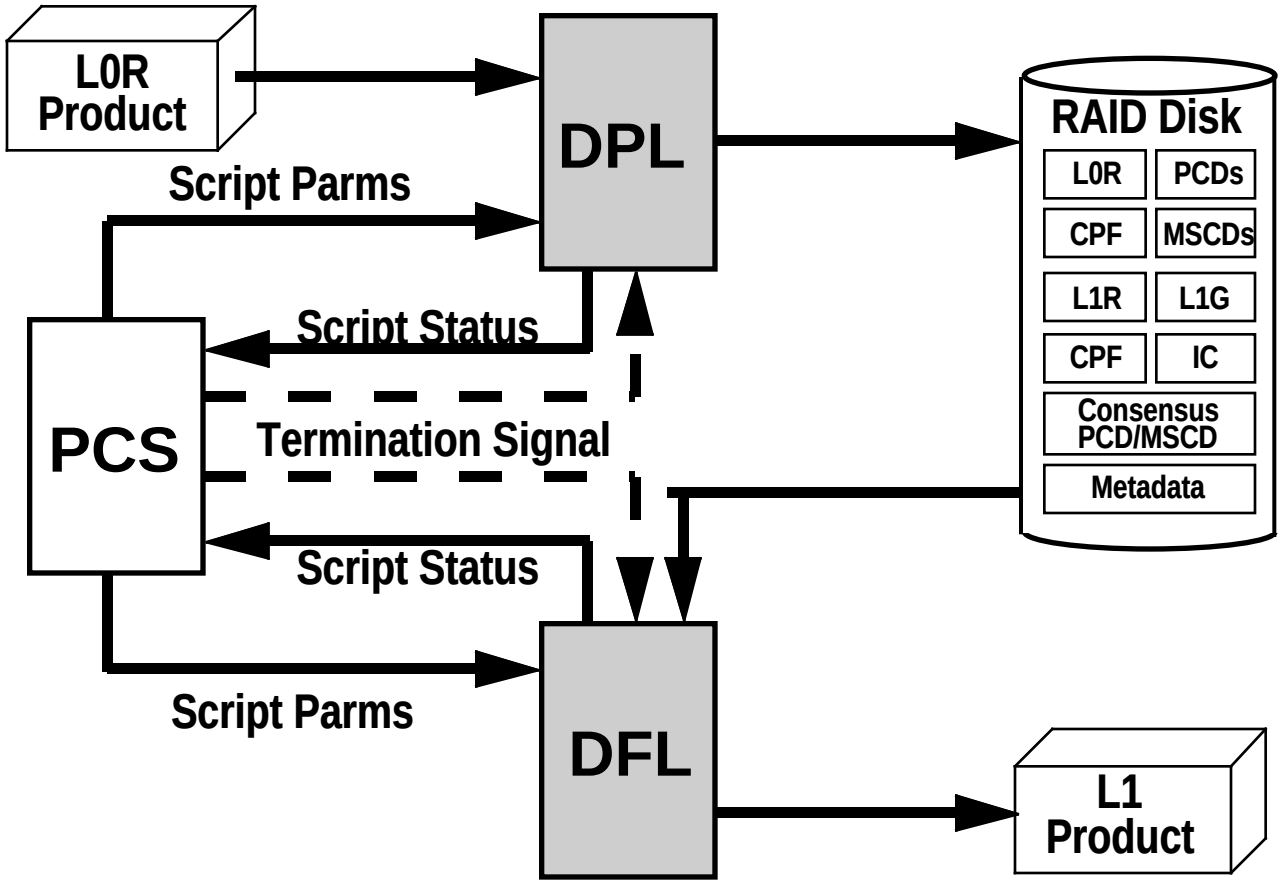
LPGS Critical Design Review

DMS Xmit L1 Product (DXL) (Cont'd)

- **Normal operations**
  - **Determines when L1 product is ready for transfer**
  - **Notifies ECS product is ready for transfer**
  - **ECS retrieves L1 products from LPGS product delivery directory**
  - **Receives notification after product retrieved by ECS**
  - **Updates database to indicate transfer status**
  - **Marks product request files and directories for deletion**
- **Termination**
  - **Receives shutdown message from PCS termination task**
  - **Disconnects from database**

LPGS Critical Design Review

DMS Script Tasks



LPGS Critical Design Review

DMS Process L0R Product (DPL)

- **Purpose**
  - **Prepares L0R data for L1 processing**
- **Invocation**
  - **Started by PCS as first L1 processing script**
- **Inputs**
  - **Script parameter filename**
  - **Script parameter file**
  - **L0R product**
- **Outputs**
  - **L0R product components (L0R image, CPF, consensus PCD and MSCD, etc.)**
  - **Script status indicating success or failure**

LPGS Critical Design Review

DMS Process L0R Product (DPL) (Cont'd)

- **Initialization**
  - **Retrieves script parameters from parameter file**
- **Normal operations**
  - **Prepares L0R product for processing**
  - **Verifies data quality within operator-modifiable thresholds before L1 processing**
  - **Generates consensus PCD and MSCD files**
- **Termination**
  - **Terminated by PCS**

LPGS Critical Design Review

DMS Format L1 Product (DFL)

- **Purpose**
  - **Formats L1 product based on user request**
- **Invocation**
  - **Started by PCS as last L1 processing script**
- **Inputs**
  - **Script parameter filename**
  - **Script parameter file**
  - **L1 product components (L1 image, CPF, consensus PCD and MSCD, etc.)**
- **Outputs**
  - **L1 product in HDF-EOS, GeoTIFF, or FAST-C format**
  - **Script status indicating success or failure**

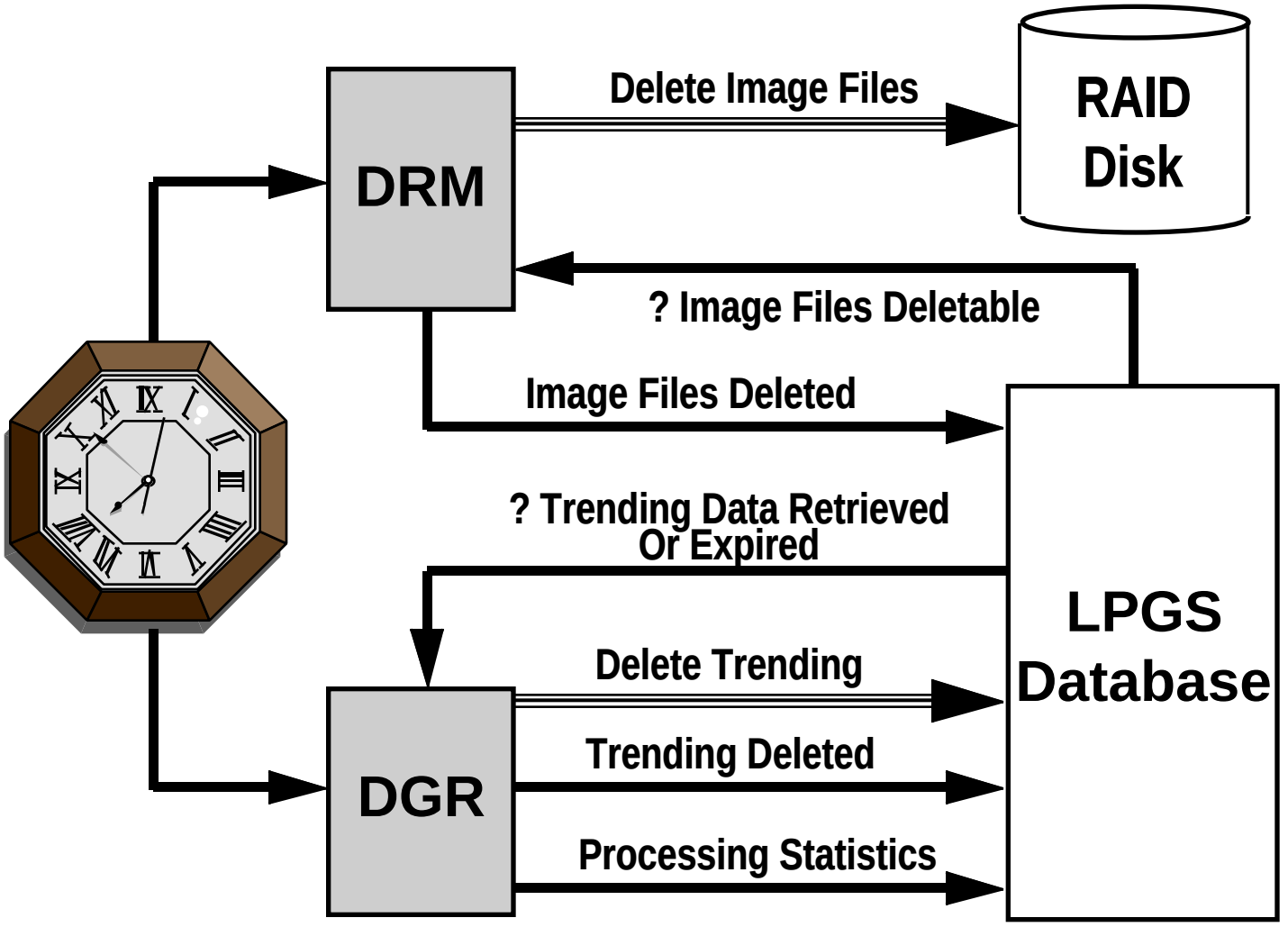
LPGS Critical Design Review

DMS Format L1 Product (DFL) (Cont'd)

- **Initialization**
  - **Retrieves script parameters from parameter file**
- **Normal operations**
  - **Converts L1 product components into HDF-EOS format**
  - **Converts L1G image into GeoTIFF or FAST-C format**
  - **Packages L1R or L1G product**
  - **Moves L1 product into product delivery directory**
  - **Checks L1 product for completeness**
- **Termination**
  - **Terminated by PCS**

LPGS Critical Design Review

DMS Offline Tasks



LPGS Critical Design Review

DMS Generate Reports (DGR)

- **Purpose**
  - **Generates Processing Statistics Report**
  - **Manages IAS interface**
  - **Provides operator means to delete trending data**
- **Invocation**
  - **Started by PCS initialization task**
  - **Runs in background**
- **Inputs**
  - **Product request state specifying trending data that are deletable or expired**
  - **Operator-modifiable parameters that specify**
    - **How often processing statistics are stored**
    - **How often trending data are deleted**
    - **How long trending data are retained**

LPGS Critical Design Review

DMS Generate Reports (DGR) (Cont'd)

- **Inputs (cont'd)**
  - **Operator requests to**
    - **Display processing statistics**
    - **Delete trending data**
- **Outputs**
  - **Deletes trending data when**
    - **Marked for deletion by IAS**
    - **Expired**
    - **Requested by operator**
  - **Updates database state indicating trending data deleted**
  - **Retrieves processing statistics from database and displays data via Accounting Report screen**
- **Initialization**
  - **Connects to database**
  - **Sets up timers**

LPGS Critical Design Review

DMS Generate Reports (DGR) (Cont'd)

- **Normal operations**
  - **Generates Processing Statistics Report**
    - **Periodically stores statistics in database**
    - **Provides statistics summary via Accounting Report screen**
  - **Manages IAS interface**
    - **Deletes marked and expired trending data**
    - **Provides capability to delete trending data via Delete Trending screen**
- **Termination**
  - **Receives shutdown message from PCS termination task**
  - **Disconnects from database**

LPGS Critical Design Review

DMS Resource Manager (DRM)

- **Purpose**
  - **Manages files and directories associated with product requests**
  - **Provides operator means to delete product request files and directories**
- **Invocation**
  - **Started by PCS initialization task**
  - **Runs in background**
- **Inputs**
  - **Product request state indicating image data is deletable**
  - **Operator-modifiable parameters that control**
    - **Processing timers**
    - **Disk utilization warnings**
  - **Operator request to delete product request files and directories**

LPGS Critical Design Review

DMS Resource Manager (DRM) (Cont'd)

- **Outputs**
  - **Deletes image data when**
    - **Marked for deletion**
    - **Requested by operator**
  - **Updates database to indicate image files were deleted**
- **Initialization**
  - **Connects to database**
  - **Sets up timer**

LPGS Critical Design Review

DMS Resource Manager (DRM) (Cont'd)

- **Normal operations**
  - **Periodically deletes files and directories marked for deletion**
  - **Updates database to indicate files were deleted**
  - **Periodically checks disk usage**
  - **Provides operator with means to delete product request files and directories via Delete Image Files screen**
- **Termination**
  - **Receives shutdown message from PCS termination task**
  - **Disconnects from database**

LPGS Critical Design Review

DMS Operator-Specifiable Parameters

Parameter Name	Purpose	Default Value	Task Name
DAN_POLLING_PERIOD	Amount of time between queries of the DAN directory to determine if requested L0R product has been placed in staging area by ECS	TBD	DIL
DDA_POLLING_PERIOD	Amount of time between queries of DDA directory to determine if ECS has responded to DDN	TBD	DIL
L0R_RECEIPT_WAIT_PERIOD	Amount of time ECS has to stage L0R product	TBD	DIL
L0R_REQUEST_WAIT_PERIOD	Amount of time between requests for L0R products	TBD	DIL
MAX_SCENES_INGESTED_PER_DAY	Maximum number of WRS scenes that can be requested in single day	28	DIL
SOCKET_RESPONSE_PERIOD	Amount of time task waits for response from ECS before timing out	TBD	DIL

LPGS Critical Design Review

DMS Operator-Specifiable Parameters (Cont'd)

Parameter Name	Purpose	Default Value	Task Name
PAN_WAIT_PERIOD	Amount of time task waits for ECS to return a PAN file before timing out	TBD	DXL
STATS_RECORDING_INTERVAL	Period over which processing statistics are aggregated and written to database	TBD	DGR
TRENDING_DATA_DELETE_PERIOD	Amount of time between clean-up of trending data marked for deletion	TBD	DGR
TRENDING_DATA_RETENTION_PERIOD	Amount of time trending data are kept in database before being deleted. Trending data entries that exceed this period are deleted even if data have not been transferred to IAS	TBD	DGR
CHECK_DISK_INTERVAL	Amount of time between checks of disk usage	TBD	DRM
DELETION_INTERVAL	Amount of time between clean-up of files marked for deletion	TBD	DRM

LPGS Critical Design Review

DMS Operator-Specifiable Parameters (Cont'd)

Parameter Name	Purpose	Default Value	Task Name
RESOURCE_MONITOR_INTERVAL	Amount of time between queries of LPGS to calculate system resource usage	TBD	DRM
RAID_DISK_UTL_LIMIT_1	Percentage of RAID disk space available that, when met or exceeded, causes generation of first disk space warning	TBD	DRM
RAID_DISK_UTL_LIMIT_2	Percentage of RAID disk space available that, when met or exceeded, causes generation of second disk space warning	TBD	DRM
SYSTEM_DISK_UTL_LIMIT_1	Percentage of system disk space available that, when met or exceeded, causes generation of first disk space warning	TBD	DRM
SYSTEM_DISK_UTL_LIMIT_2	Percentage of system disk space available that, when met or exceeded, causes generation of second disk space warning	TBD	DRM

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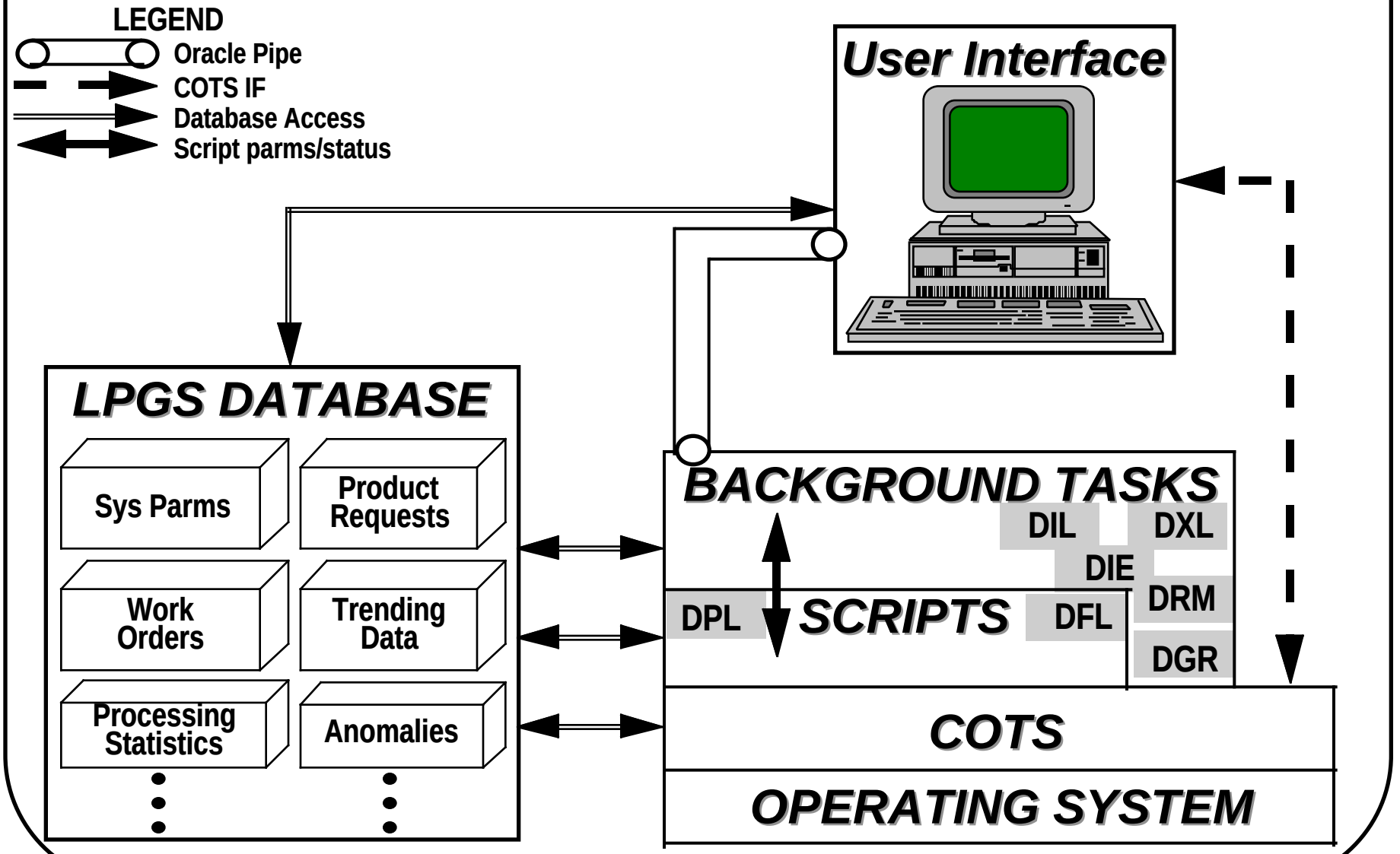
LPGS DMS
Software Architecture



LPGS Critical Design Review

DMS Open Issues

- **COTS product selection for writing L1 products**

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LPGS Critical Design Review

■ Opening Comments	J. Henegar
■ System Overview	R. Hamilton
■ Hardware Architecture	K. Jeletic
■ Operational Scenarios	K. Jeletic
■ Level 1 Product Formats	L. Lindrose
■ Performance Analysis	W. Wang
■ LPGS Software Subsystem Design	
• Design Overview	B. Pedersen
• End-to-End Scenarios	B. Pedersen
• User Interface	O. Mechaly
• Data Management Subsystem	S. Beckwell
• Process Control Subsystem	B. Pedersen
• Radiometric and Geometric Processing Subsystems	B. Pedersen
• Quality Assessment Subsystem	S. Kraft
• Anomaly Analysis Subsystem	B. Nair
■ System Test	E. Crook
■ Conclusion	J. Henegar

LPGS Critical Design Review

Process Control Subsystem (PCS)

- Purpose
- Context diagram
- Design decisions
- Tasks
- Task model
- Task descriptions
- L1 processing control
- Software architecture
- Operator-specifiable parameters

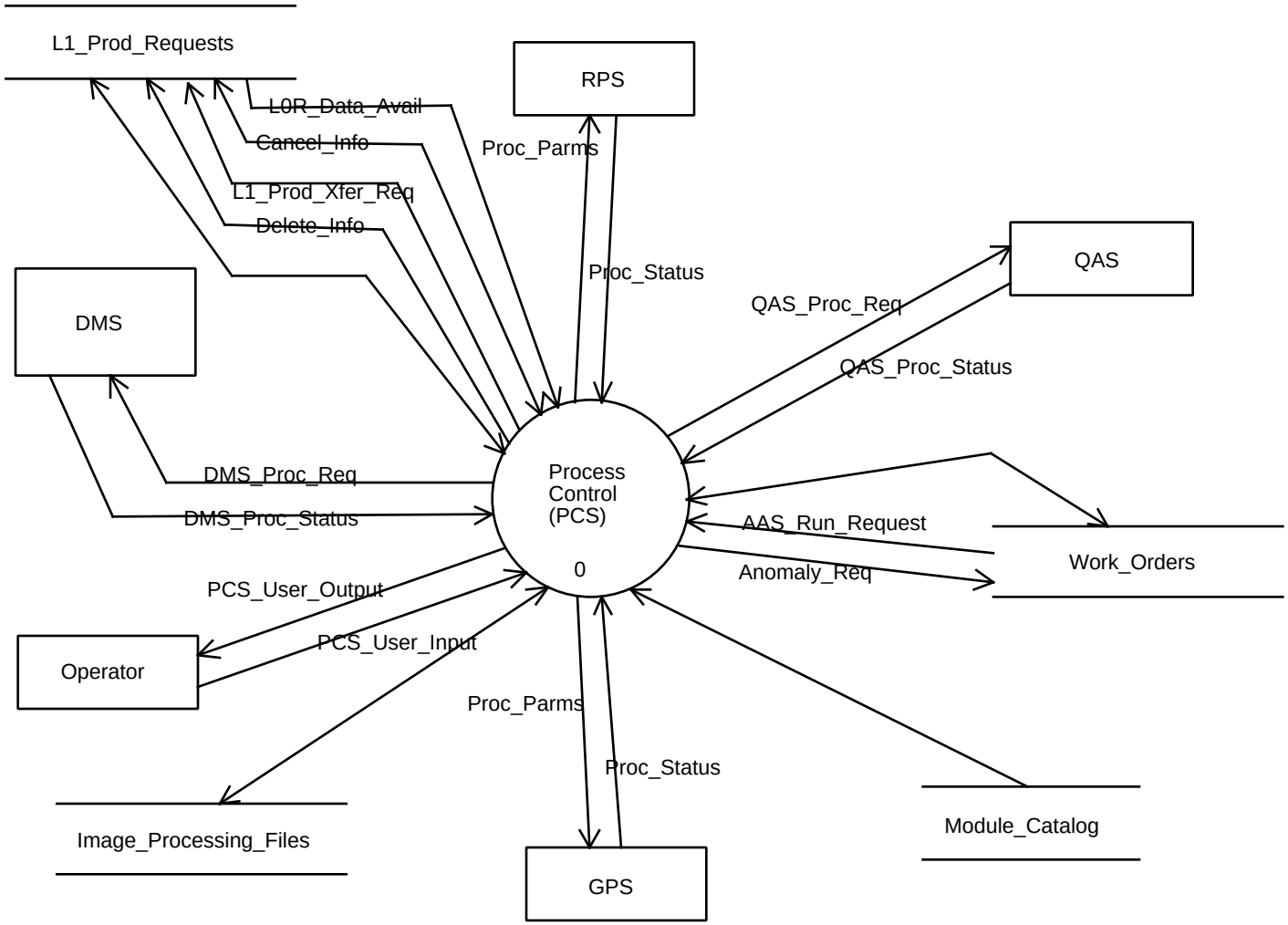
LPGS Critical Design Review

PCS Purpose

- **Provides automated production control functions**
  - **Scheduling**
  - **Processing**
- **Allows manual overrides**
- **Provides system control functions**
  - **Startup**
  - **Restart**
  - **Termination**

LPGS Critical Design Review

PCS Context Diagram



LPGS Critical Design Review

PCS Design Decisions

- **General**
  - **Supports concurrent processing of product requests**
  - **Uses operator-modifiable parameters to control L1 processing flow through production pipeline**

- **Visual quality assessment (Visual QA)**
  - **Halts processing to allow for visual inspection after L1R, L1G, and final packaging**
  - **Controls frequency of visual inspections via an operator-modifiable parameter**

LPGS Critical Design Review

PCS Tasks

- **PCS consists of 4 tasks**
  - **System Initialization/Termination (PSI)**
  - **Work Order Scheduler (PWS)**
  - **Work Order Generator (PWG)**
  - **Work Order Controller (PWC)**

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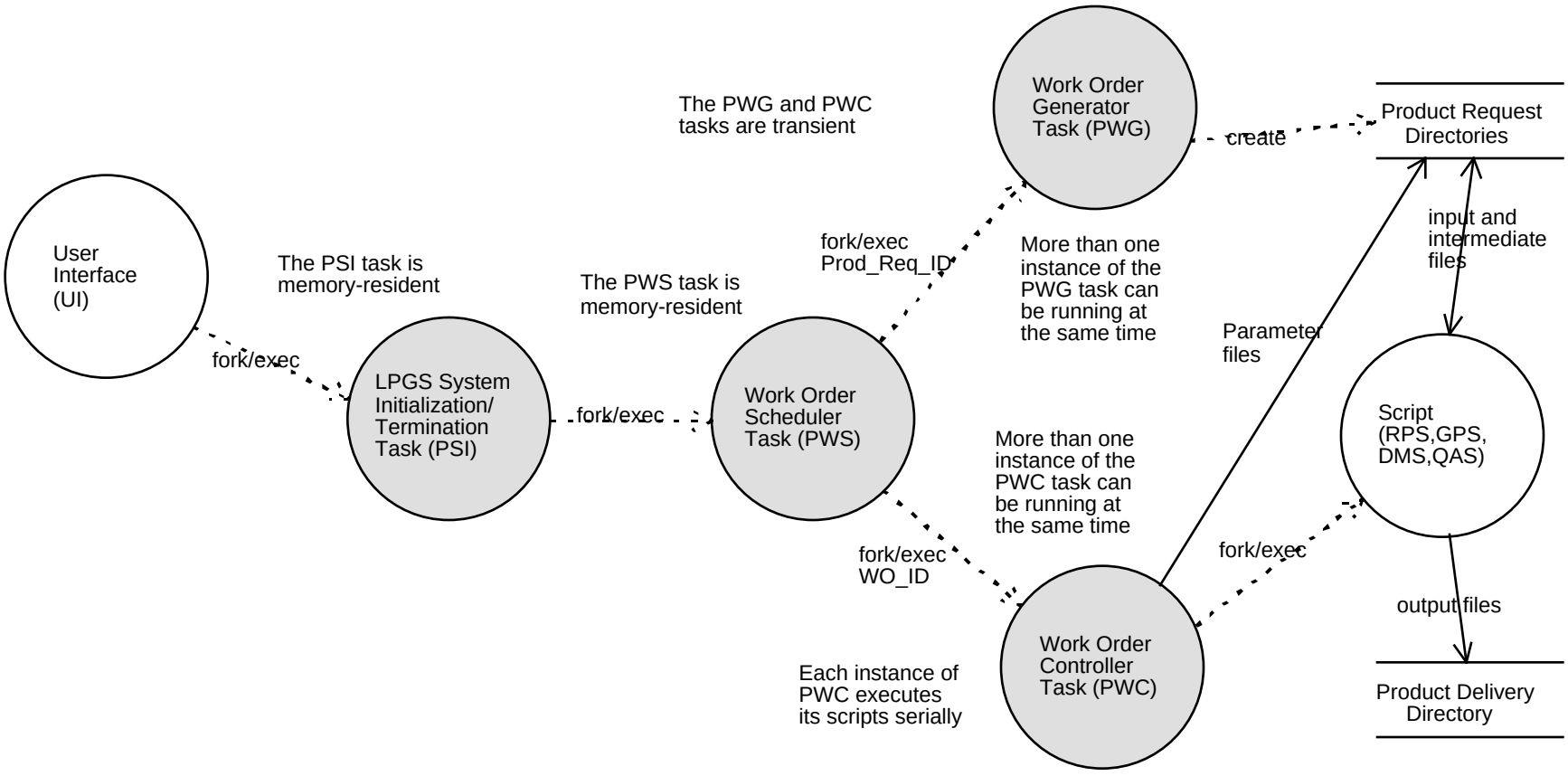
PCS Task Model



LPGS Critical Design Review

PCS System Initialization/Termination (PSI)

- **Purpose**
  - **Provides system control functions**
    - **Startup**
    - **Restart**
    - **Termination**
- **Invocation**
  - **Started from UI**
- **Inputs**
  - **Retrieves polling interval from database**
  - **Retrieves task list from database**
  - **Retrieves directives from database**
- **Outputs**
  - **Writes to event log**

LPGS Critical Design Review

PCS System Initialization/Termination (PSI) (Cont'd)

- **Initialization**
  - **Retrieves PSI parameters from database**
  - **Retrieves task list from database**
  - **Starts background tasks**
- **Normal operations**
  - **Monitors background tasks**
  - **Periodically polls database for directives**
- **Termination**
  - **Sends graceful shutdown message to all background tasks**
  - **Terminates all background tasks for immediate shutdown**

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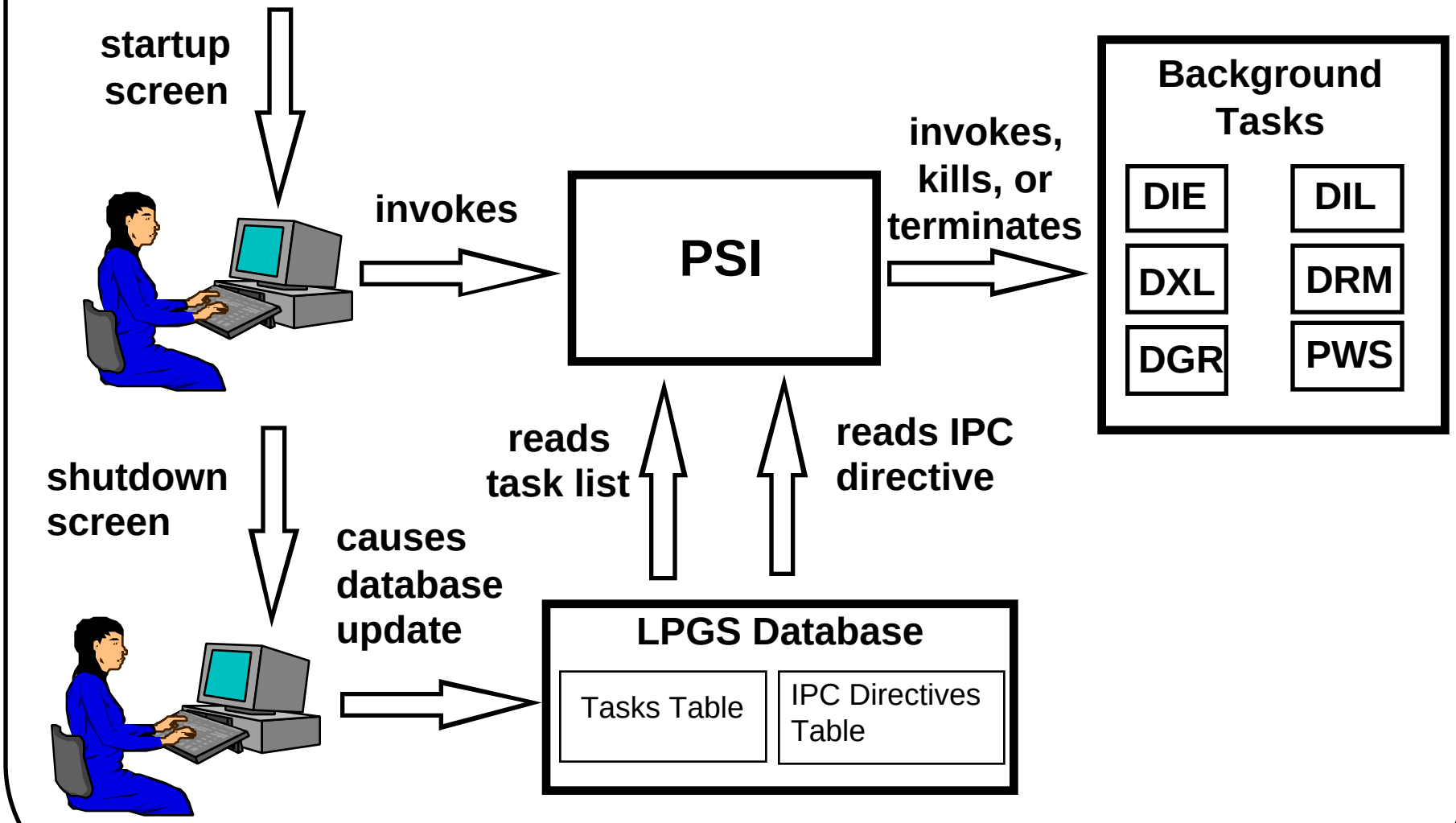
PCS System Initialization/Termination (PSI) (Cont'd)



LPGS Critical Design Review

PCS Work Order Scheduler (PWS)

- **Purpose**
  - **Schedules work order processing**
    - **Generates new work orders**
    - **Starts work orders**
    - **Resumes work orders**
  - **Processes new work orders in FIFO order except when operator has promoted the product request/work order**
- **Invocation**
  - **Started by PSI**
- **Inputs**
  - **Retrieves operator-modifiable parameters from database**
  - **Selects product request ready for work order generation (L0R data available)**

LPGS Critical Design Review

PCS Work Order Scheduler (PWS) (Cont'd)

- **Inputs (cont'd)**
  - **Selects work order ready to start from database**
  - **Selects work order ready to resume from database**

  Outputs
  - **Updates product request state in database**
  - **Updates work order state in database**
  - **Writes to event log**
  - **Creates work order log in work order directory**
- **Initialization**
  - **Retrieves PWS parameters from database**
  - **Establishes polling timer**

LPGS Critical Design Review

PCS Work Order Scheduler (PWS) (Cont'd)

- **Normal operations**
  - **Initiates work order generation**
    - **Identifies product request that has L0R available**
    - **Checks for request cancellation**
    - **Starts PWG for product request**
    - **Uses operator-modifiable parameter to control number of work orders generated at one time**
  - **Starts work orders that are ready to begin processing**
    - **Checks for request cancellation**
    - **Uses operator-modifiable parameters to control number of active and executing work orders**
    - **Creates work order log**
    - **Starts PWC to begin running work order scripts**

LPGS Critical Design Review

PCS Work Order Scheduler (PWS) (Cont'd)

- **Normal operations (cont'd)**
  - **Resumes work orders that were halted previously**
    - **Checks for request cancellation**
    - **Uses operator-modifiable parameters to control number of active and executing work orders**
    - **Starts PWC to resume with next work order script**
- **Termination**
  - **Receives shutdown message from PSI**
  - **Checks for shutdown before initiating new activity**
  - **Terminates at convenient break points**

LPGS Critical Design Review

PCS Work Order Generator (PWG)

- **Purpose**
  - **Generates work order for specific product request**
- **Invocation**
  - **Started by PWS**
- **Inputs**
  - **Receives parameter specifying product request ID**
  - **Reads work order template including script and default parameters from database**
  - **Retrieves processing options from product request in the database**

LPGS Critical Design Review

PCS Work Order Generator (PWG) (Cont'd)

- **Outputs**
  - **Updates product request state in database to indicate work order processing initiated**
  - **Stores work order information in database**
  - **Creates work order directory**
- **Initialization**
  - **Retrieves input parameter from command line**

LPGS Critical Design Review

PCS Work Order Generator (PWG) (Cont'd)

- **Normal operations**
  - **Selects work order template**
  - **Retrieves work order script information**
  - **Retrieves default parameters**
  - **Retrieves request options**
  - **Stores work order information in the database**
  - **Creates work order directory**
- **Termination**
  - **PWS handles shutdown issues for PWG**

LPGS Critical Design Review

PCS Work Order Controller (PWC)

- **Purpose**
  - **Controls and monitors execution of work order scripts**
  - **Executes scripts serially**
- **Invocation**
  - **Started by PWS**
- **Inputs**
  - **Receives parameter identifying work order to be processed**
  - **Selects next script to process from database**
  - **Retrieves work order script parameters from database**

LPGS Critical Design Review

PCS Work Order Controller (PWC) (Cont'd)

- **Outputs**
  - **Updates database with script completion status**
  - **Updates product request in database with cancellation information**
  - **Updates product request in database to indicate product ready to transfer**
  - **Updates product request in database to indicate trending data are available for transfer**
  - **Updates work order to indicate encountered problem**
  - **Writes to event log**
  - **Creates script parameter file in work order directory**
- **Initialization**
  - **Retrieves input parameter from command line**

LPGS Critical Design Review

PCS Work Order Controller (PWC) (Cont'd)

- **Normal operations**
  - **Checks for request cancellation**
  - **Identifies next script to start**
  - **Retrieves script parameters**
  - **Creates script parameter file**
  - **Starts script and waits for completion**
  - **Checks script's completion status**
  - **Continues processing scripts until**
    - **Receives failure status from script**
    - **Encounters scheduled halt (normally for visual quality assessment)**
    - **Completes all scripts for work order**

LPGS Critical Design Review

PCS Work Order Controller (PWC) (Cont'd)

- **Normal operations (cont'd)**
  - **Updates database to indicate trending data are available for transfer**
  - **Notifies DXL that L1 product is ready for shipment via database update**
  - **Notifies AAS that processing failed**
- **Termination**
  - **PWS notifies PWC of shutdown**
  - **PWC handles shutdown for work order scripts**
  - **Checks for shutdown before starting next script**

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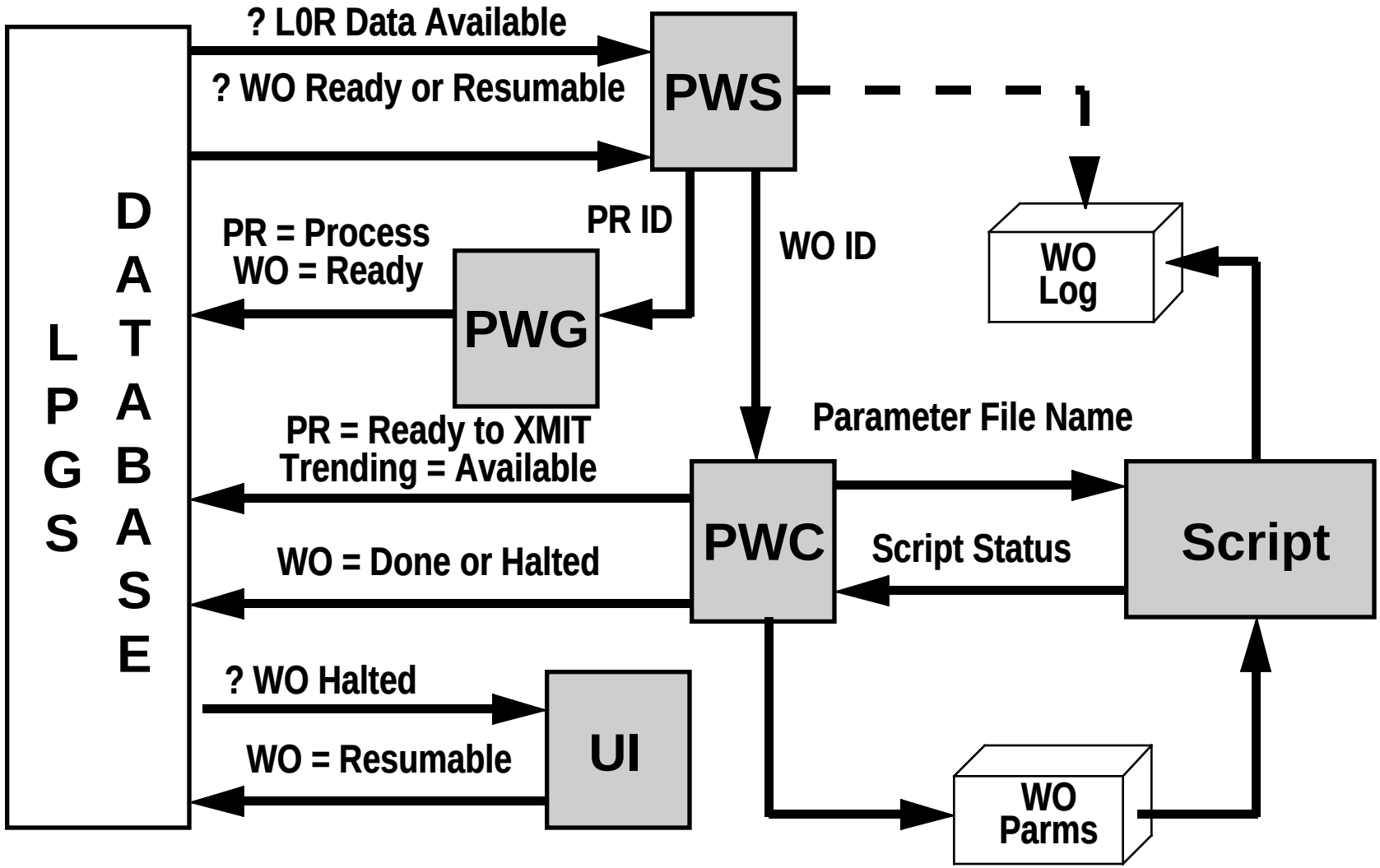
LPGS Critical Design Review

PCS L1 Processing Control



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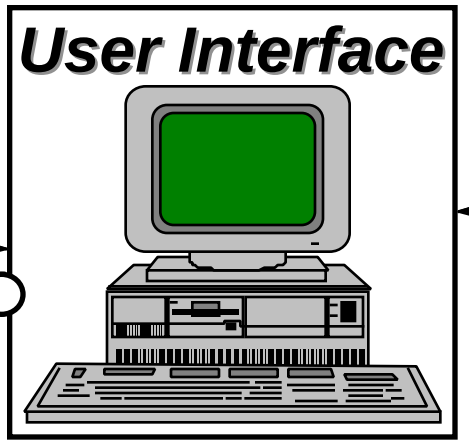
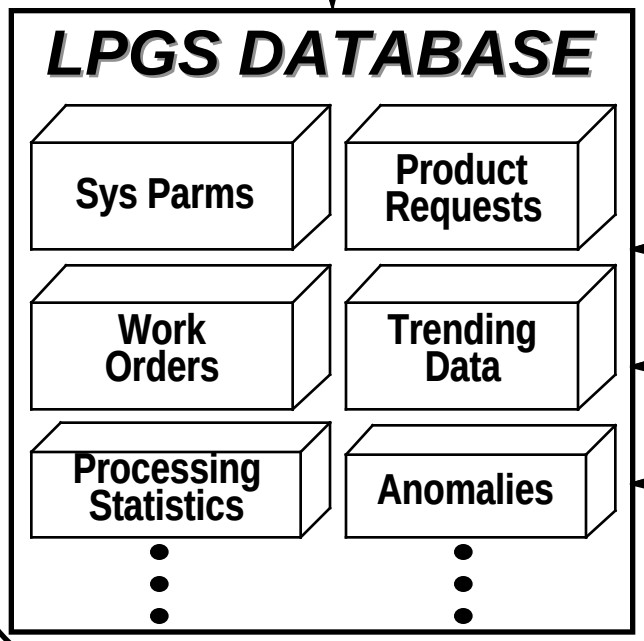
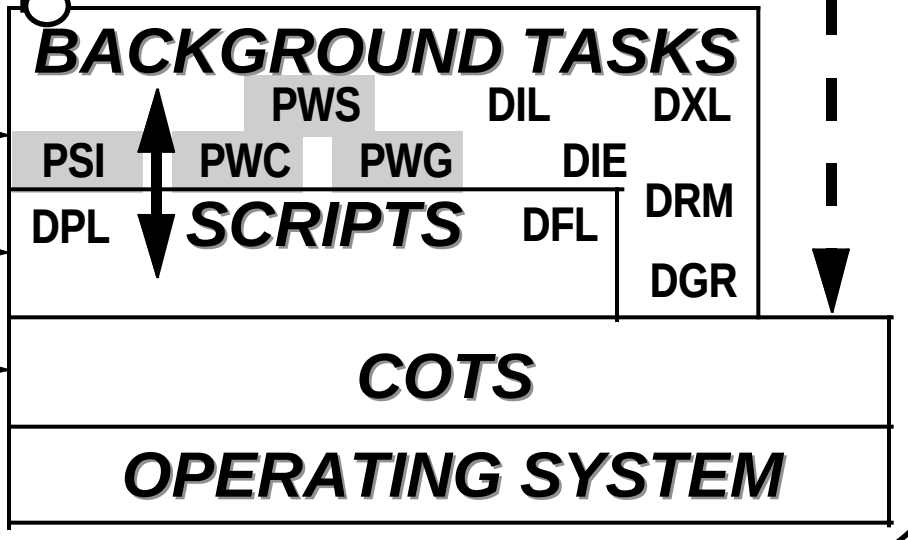
LPGS Critical Design Review

LPGS DMS & PCS Software Architecture







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LPGS Critical Design Review

PCS Operator-Specifiable Parameters

Parameter Name	Purpose	Default Value	Task Name
VISUAL_QA_FREQUENCY	Frequency of product requests to undergo visual quality assessment (e.g., every 1 in N)	TBD	PWG
MAX_CONCURRENT_WO	Maximum number of work orders that can be actively undergoing processing at same time	4	PWS
MAX_STARTED_WO	Maximum number of started work orders whose files are still on LPGS	TBD	PWS
WORK_ORDER_SCHEDULER_INTERVAL	Amount of time between checks for work orders that can be started or resumed	TBD	PWS
PSI_POLLING_INTERVAL	Amount of time between checks for new directives	TBD	PSI
MAX_WO_GEN	Maximum number of work orders that can be generated at same time	TBD	PWS

LPGS Critical Design Review

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■ Conclusion	J. Henegar

LPGS Critical Design Review

RPS and GPS

- Radiometric Processing Subsystem (RPS)
- Geometric Processing Subsystem (GPS)
- Software architecture

LPGS Critical Design Review

Radiometric Processing Subsystem (RPS)

- **Purpose**
  - **Performs radiometric characterization**
  - **Performs radiometric correction**
- **Reused from IAS**
- **Invocation**
  - **Started by PWC after L0R preprocessing (DPL)**
- **Inputs**
  - **Receives script parameter identifying parameter filename**
  - **Reads L0R product files**
  - **Retrieves parameters from script parameter file**

LPGS Critical Design Review

RPS (Cont'd)

- **Outputs**
  - **Returns script status indicating success or failure**
  - **Writes L1R files to work order directory**
  - **Writes to work order log**
  - **Stores trending data in database**

LPGS Critical Design Review

Geometric Processing Subsystem (GPS)

- **Purpose**
  - **Creates systematically corrected L1G image**
- **Reused from IAS**
- **Invocation**
  - **Started by PWC after L1R quality assessment**
- **Inputs**
  - **Receives script parameter identifying parameter filename**
  - **Reads L1R files**
  - **Retrieves parameters from script parameter file**

LPGS Critical Design Review

GPS (Cont'd)

- **Outputs**
  - **Returns script status indicating success or failure**
  - **Writes L1G files to work order directory**
  - **Writes to work order log**
  - **Stores trending data in database**

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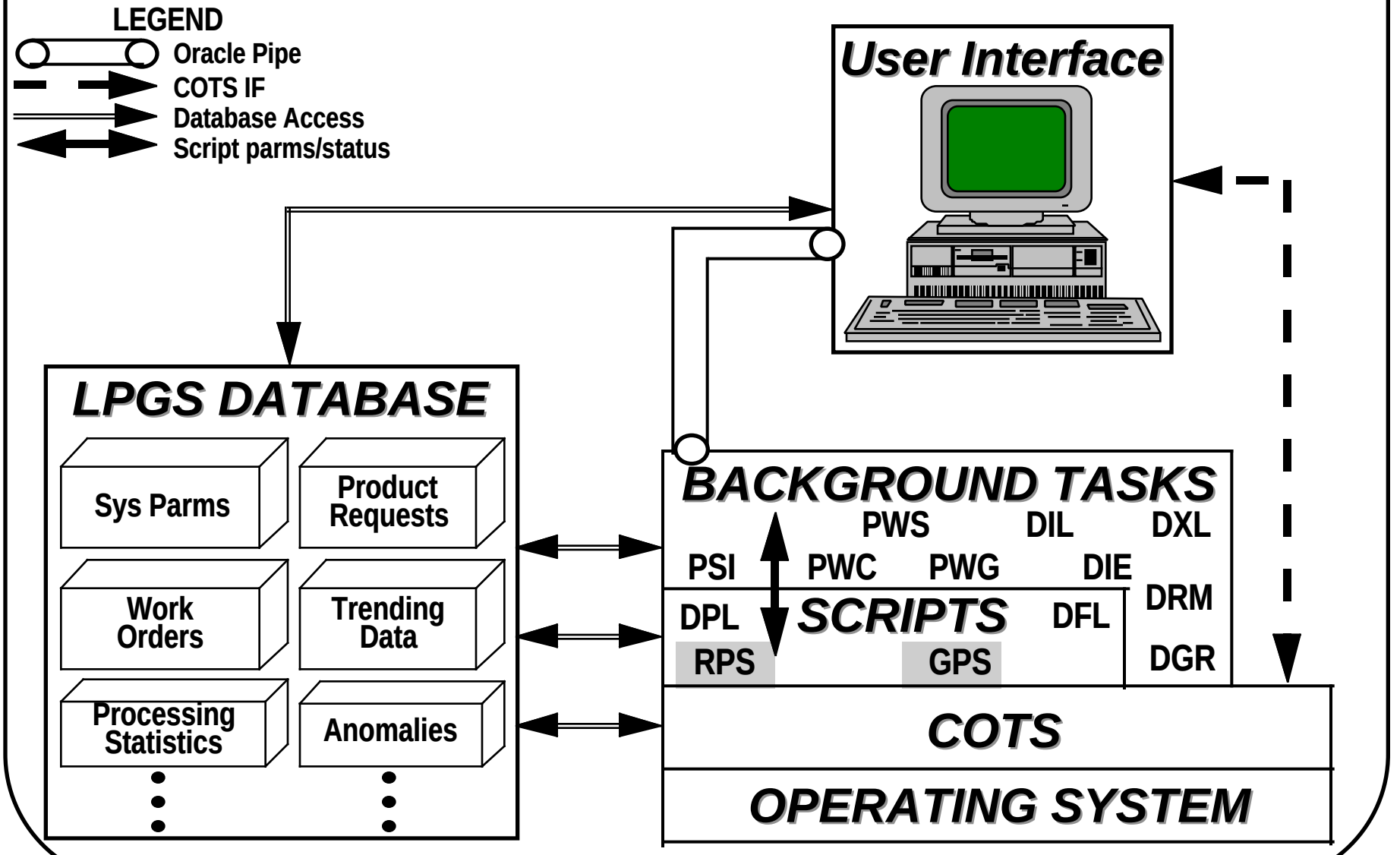
LPGS Critical Design Review

LPGS DMS, PCS, RPS, and GPS Software Architecture



LPGS Critical Design Review

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LPGS Critical Design Review

QAS

- Purpose
- Context diagram
- Design decisions
- Tasks
- Task descriptions
- Sample screens
- Software architecture
- Open issues

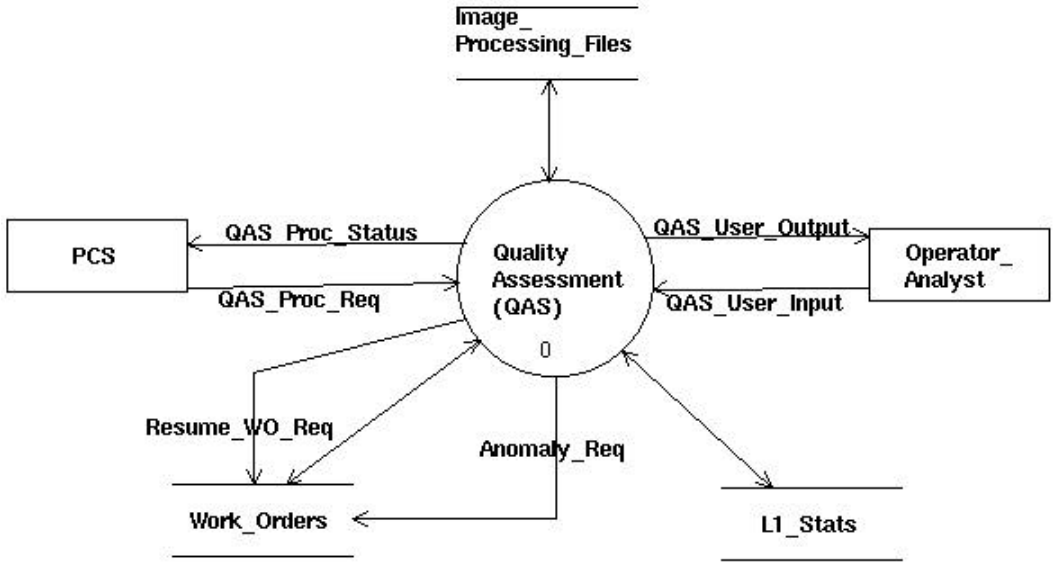
LPGS Critical Design Review

QAS Purpose

- **Provides automated assessment of the image quality**
- **Uses RPS and GPS image characterization and correction information**
- **Stores a summary of image quality in database**
- **Provides capability to view**
  - **Image**
  - **Quality information**

LPGS Critical Design Review

QAS Context Diagram



LPGS Critical Design Review

QAS Design Decisions

- **Uses COTS packages**
  - **Visual quality assessment**
  - **Oracle Forms for GUI**
- **Uses RPS and GPS output information, and data thresholds to determine image quality**
- **Uses default quality assessment thresholds**
  - **Stored in parameter table**
  - **Maintained via a user interface**
  - **Modified over time**

LPGS Critical Design Review

QAS Tasks

- **QAS consists of 3 tasks**
  - **Automated L1R Quality Assessment (Q1R)**
  - **Automated L1G Quality Assessment (Q1G)**
  - **Visual Quality Assessment User Interface (QUI)**

LPGS Critical Design Review

QAS Automated L1R Quality Assessment (Q1R)

- **Purpose**
  - **Performs quality assessment of L1R image**
- **Invocation**
  - **Started by PWC after completion of RPS functions**
- **Inputs**
  - **Receives script parameter identifying parameter filename**
  - **Retrieves characterization results from database**
  - **Reads L1R thresholds from script parameter file**

LPGS Critical Design Review

QAS Automated L1R Quality Assessment (Q1R) (Cont'd)

- **Outputs**
  - **Returns script status indicating success or failure**
  - **Stores L1R quality assessment summary in database**
  - **Writes to event log**
  - **Writes to work order log**
- **Initialization**
  - **Retrieves script parameter**

LPGS Critical Design Review

QAS Automated L1R Quality Assessment (Q1R) (Cont'd)

- **Normal operations**
  - **Reads L1R thresholds from script parameter file**
  - **Retrieves characterization results from database**
  - **Determines quality assessment using thresholds and characterizations**
  - **Stores quality assessment results in database**
  - **Returns status**
- **Termination**
  - **PWC handles termination for Q1R**

LPGS Critical Design Review

Q1R Thresholds

- **Using thresholds, Q1R reads label mask and histogram analysis**
  - **Location and number of missing minor frames**
  - **Location and level**
    - **Saturated detectors**
    - **Impulse noise**
    - **Random noise**

LPGS Critical Design Review

QAS Automated L1G Quality Assessment (Q1G)

- **Purpose**
  - **Performs quality assessment of L1G image**
- **Invocation**
  - **Started by PWC after completion of GPS functions**
- **Inputs**
  - **Receives script parameter identifying parameter filename**
  - **Retrieves characterization results from database**
  - **Reads L1G thresholds from script parameter file**

LPGS Critical Design Review

QAS Automated L1G Quality Assessment (Q1G) (Cont'd)

- **Outputs**
  - **Returns script status indicating success or failure**
  - **Stores L1G quality assessment summary in database**
  - **Writes to event log**
  - **Writes to work order log**
- **Initialization**
  - **Retrieves script parameter**

LPGS Critical Design Review

QAS Automated L1G Quality Assessment (Q1G) (Cont'd)

- **Normal operations**
  - **Reads L1G thresholds from script parameter file**
  - **Retrieves characterization results from the database**
  - **Determines quality assessment using thresholds and characterizations**
  - **Stores quality assessment results in database**
  - **Returns status**
- **Termination**
  - **PWC handles termination for Q1G**

LPGS Critical Design Review

Q1G Thresholds

- **Using thresholds and flags, Q1G monitors and assesses data quality associated with**
  - **Ephemeris**
  - **Attitude displacement sensor (ADS)**
  - **Gyro**
  - **Gyro drift**
  - **Spacecraft attitude**
  - **Spacecraft time correction**
  - **First half scan error (FHSERR) and second half scan error (SHSERR)**
  - **Scan direction**
  - **Scan start time**
  - **Counted line length**
  - **Corners**
  - **Scan gap**

LPGS Critical Design Review

QAS Virtual Quality Assessment User Interface (QUI)

- **Purpose**
  - **Displays any single band of L1R or L1G digital image for visual quality assessment**
  - **Prints color hardcopy of any band(s) of L1R and L1G digital image**
  - **Displays and prints L1 digital image quality assessment results and summary**
  - **Uses COTS product for viewing images**
- **Invocation**
  - **Started from UI**

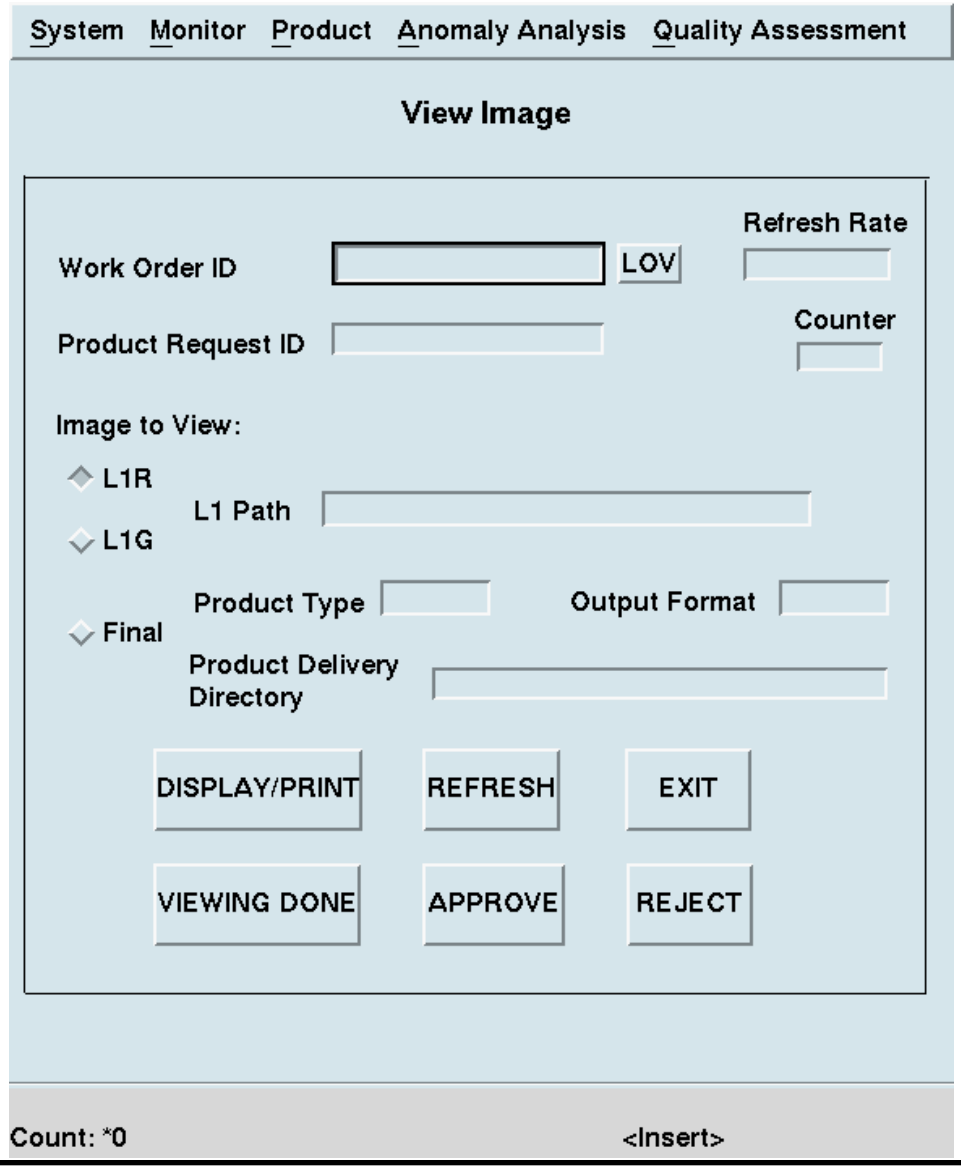
LPGS Critical Design Review

QAS Virtual Quality Assessment User Interface (QUI) (Cont'd)

- **Inputs**
  - **Reads user input from form**
  - **Reads image files**
  - **Retrieves quality assessment summary from database**
- **Outputs**
  - **Displays image to terminal**
  - **Displays quality assessment results to terminal**
  - **Prints image**
  - **Updates database to indicate approval or disapproval of image**

LPGS Critical Design Review

QAS View Image



LPGS Critical Design Review

QAS Summary

LPGS/QAS Summary

WO Num:
PR Num:
Scan Date:
Customer Name:
Customer Address:

Parameter Name	Received	Nominal	Description
Missing Minor Frame:			
Start: Dataline/mf	d1/550	range<N	Possible Pixel Noise
Stop: Dataline/mf	d1/600		
Start: Dataline/mf	d3/40	range<M	Possible Dropped Line
Stop: Dataline/mf	d3/5000		
Impulse Noise:			
Band	7		
detector	13		
line	20		
minor frame			
Band	7		
detector	13		
line	21		
minor frame			
Scan Gap:			
Scan Gap	N		
Scan Gap (Maximum)		X	Scan Gap Exceeds Max
Scan Gap (Minimum)		Y	
Corners:			
Flag =	reset	reset	Corners align
Counted Line Length:			
Total Lines in Error	30	4	Threshold exceeded
Valid S/C Ephemeris:			
Ephem data rate	63/MF	64/MF	Within tolerance

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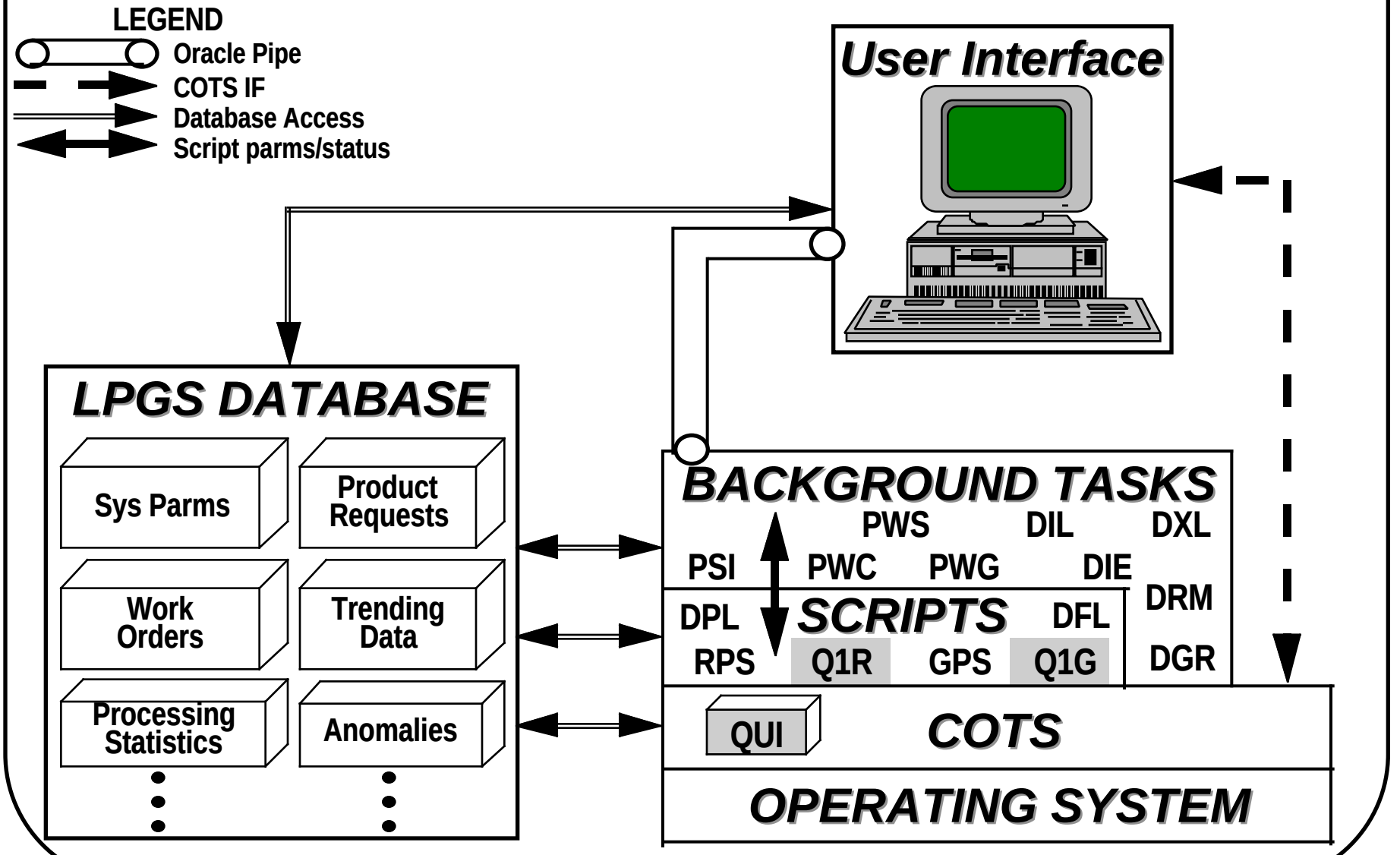
LPGS Critical Design Review

LPGS DMS, PCS, RPS, GPS, and QAS Software Architecture



LPGS Critical Design Review

QAS Open Issues

- **Have not selected COTS product to be used for viewing images**

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LPGS Critical Design Review

AAS

- Purpose
- Context diagram
- Design assumption
- Scenarios
- Sample screens
- Software architecture
- Open issues

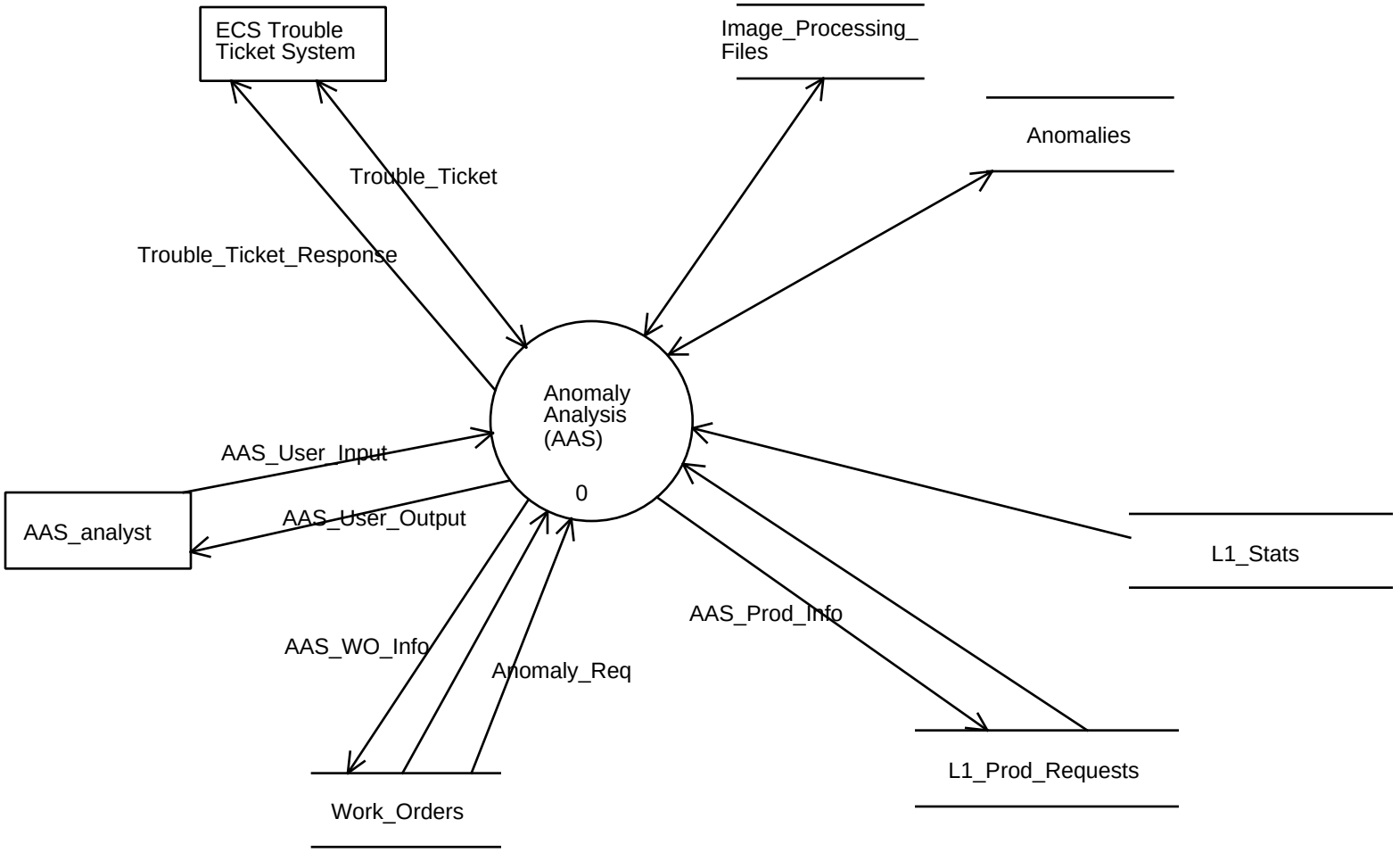
LPGS Critical Design Review

AAS Purpose

- **AAS provides tools to**
  - **Analyze LPGS internal problems**
  - **Respond to trouble tickets**
  - **Confirm LPGS integrity**

LPGS Critical Design Review

AAS Context Diagram



LPGS Critical Design Review

AAS Design Assumptions

- ECS analyst notifies LPGS analyst via phone or e-mail when new trouble ticket is in ECS trouble ticket system
- LPGS analyst accesses ECS trouble ticket system through UI
- ECS transfers returned L1 products (on tape or CD) to disk location on their system; LPGS analyst will ftp returned product from ECS to LPGS
- LPGS requests L0R data from ECS, in absence of ECS-provided product request (for analysis of trouble ticket)
- LPGS does not stage regenerated L1 product resulting from resolution of trouble ticket; ECS must submit product request for L1 product

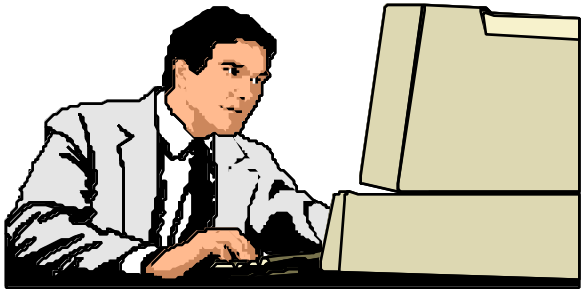
LPGS Critical Design Review

AAS Scenarios

- **AAS scenarios**
  - **LPGS integrity confirmed**
  - **Internal problem resolved successfully**
  - **Problem not able to be resolved internally**

LPGS Critical Design Review

LPGS Integrity Confirmed



LPGS Operator/ Analyst

AAS User Interface

- Run selected benchmark test(s)
- Compare product results with previous good product

LPGS Background Tasks

- Perform benchmark run

LPGS Critical Design Review

Internal Problem Resolved Successfully

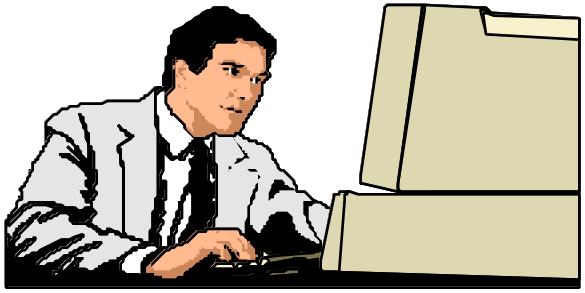
AAS User Interface

- Display failed work order
- Add problem to anomalies table
- Examine event log, product request, and work order
- Examine metadata, CPF, and quality summary
- Examine failed image
- Run benchmark (completes successfully)
- Generate diagnostic work order
- Monitor diagnostic run
- Generate diagnostic work order with corrections
- Approve product for distribution
- Close out anomaly

Events Screen

2/1/1998 WO 25 SCR 3 Intermediate L1R Image failed automatic QAS PRID 100

LPGS Analyst



LPGS Background Tasks

- Perform requested tasks

LPGS Critical Design Review

Problem Not Able To Be Resolved Internally

Events Screen

2/10/1998 WO 50 SCR 9 Intermediate L1G Image failed visual inspection PRID 150

ECS Trouble Ticket System

- Generate trouble ticket to forward problem

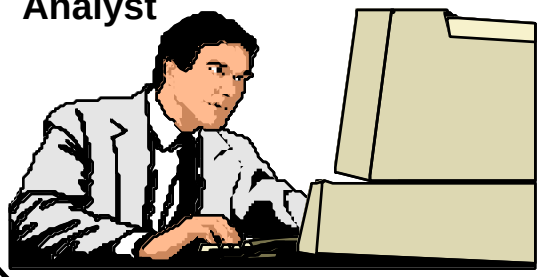
AAS User Interface

- Display failed work order
- Add problem to anomalies table
- Examine event log, product request, and work order
- Examine metadata, CPF, and quality reports
- Examine failed image
- Run benchmark (completes successfully)
- Generate diagnostic work order
- Monitor diagnostic run (problem could not be solved)
- Save input and output files associated with problem
- Access ECS trouble ticket system
- Close out anomaly

LPGS Background Tasks

- Perform requested tasks

LPGS Analyst



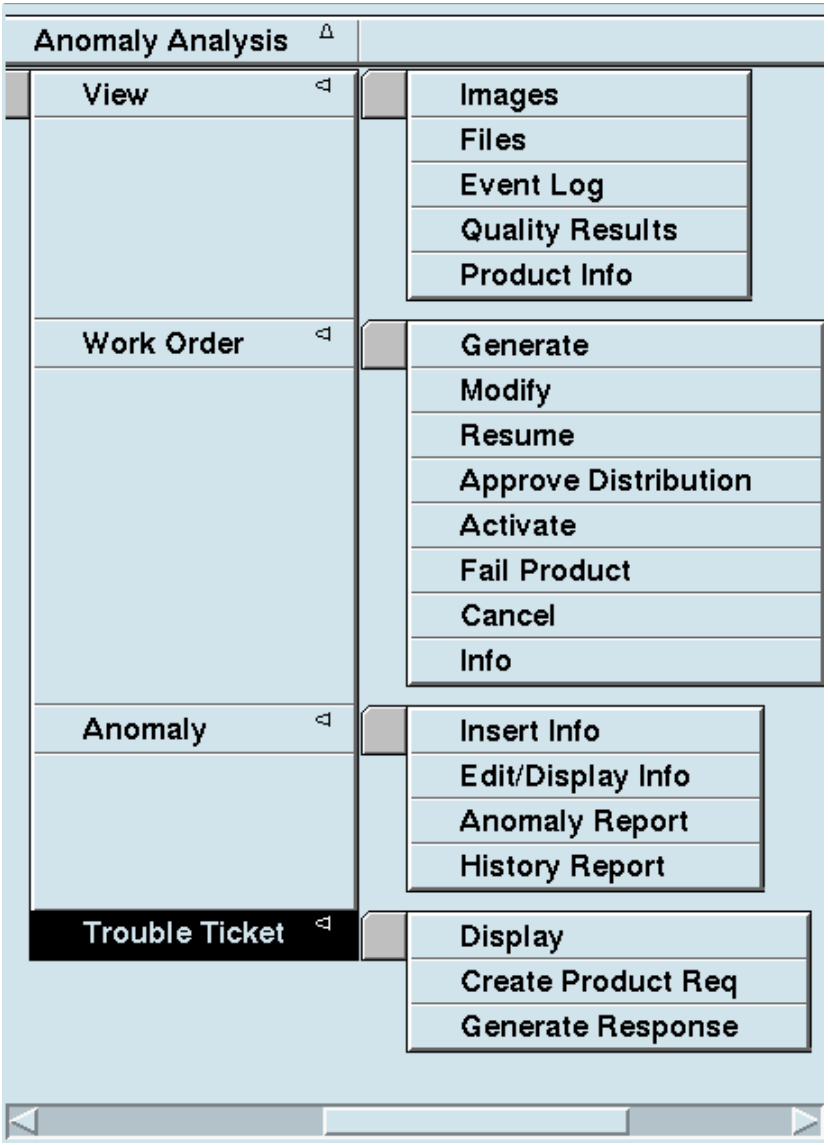
LPGS Critical Design Review

AAS Sample Screens

- **Sample screens**
  - **AAS Main Menu**
  - **Enter New Anomaly**
  - **Edit/Close Anomaly**
  - **Anomaly Report**
  - **View Image**

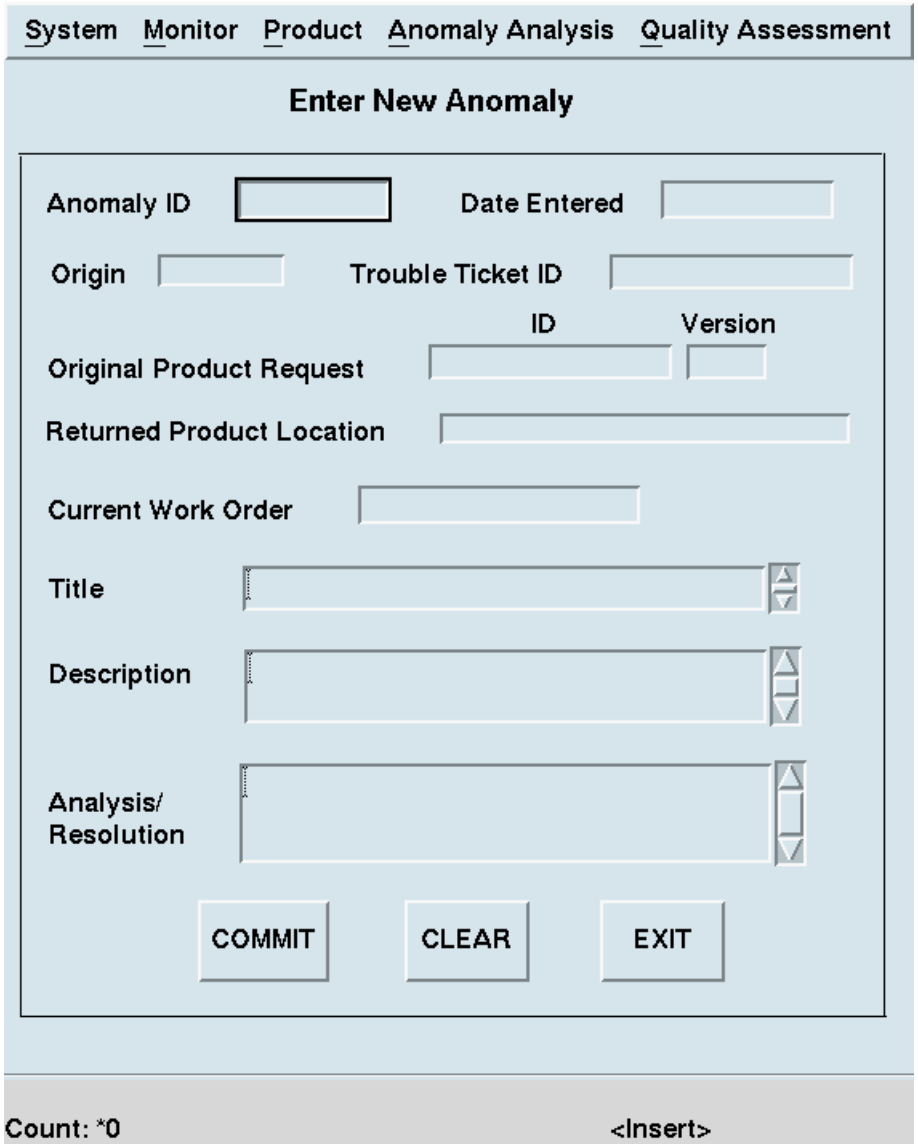
LPGS Critical Design Review

AAS Main Menu Screen



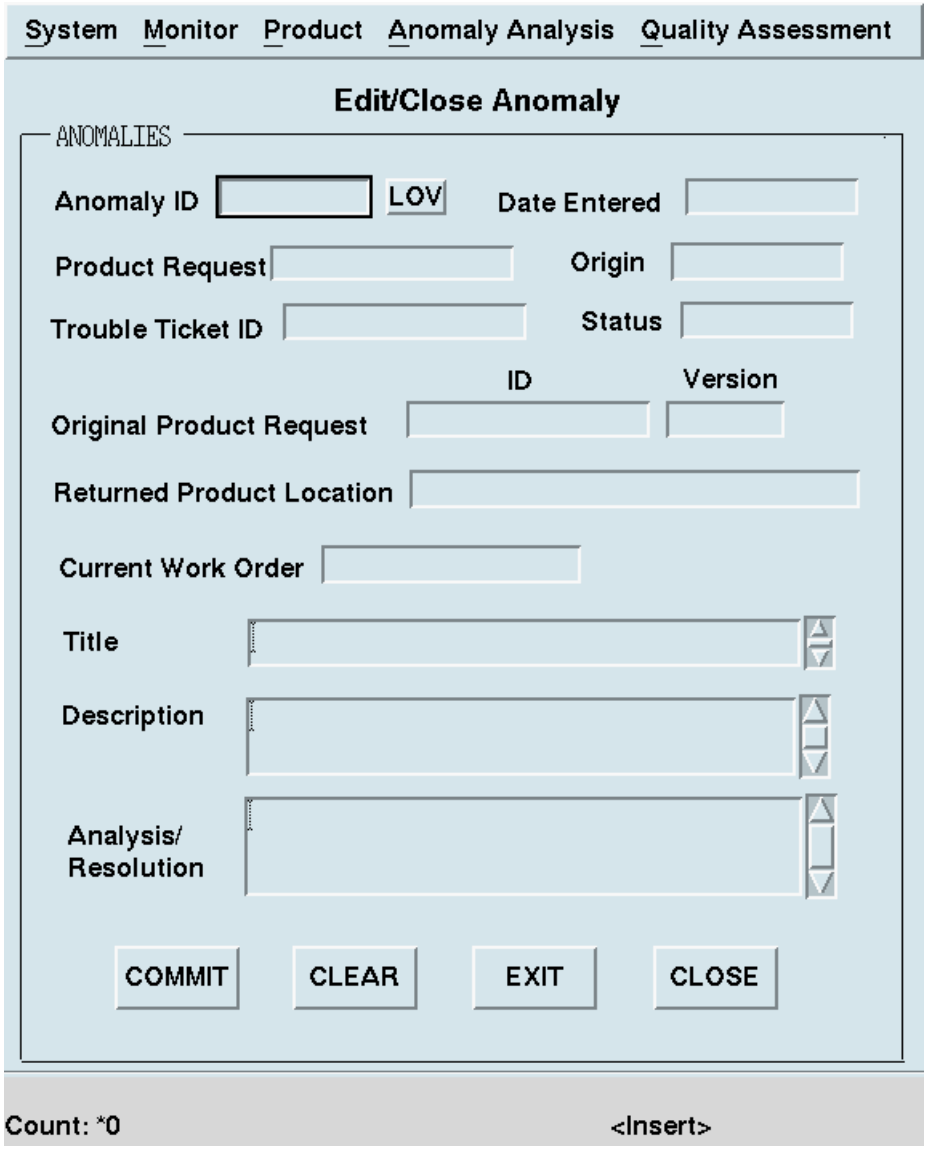
LPGS Critical Design Review

AAS Enter New Anomaly Screen



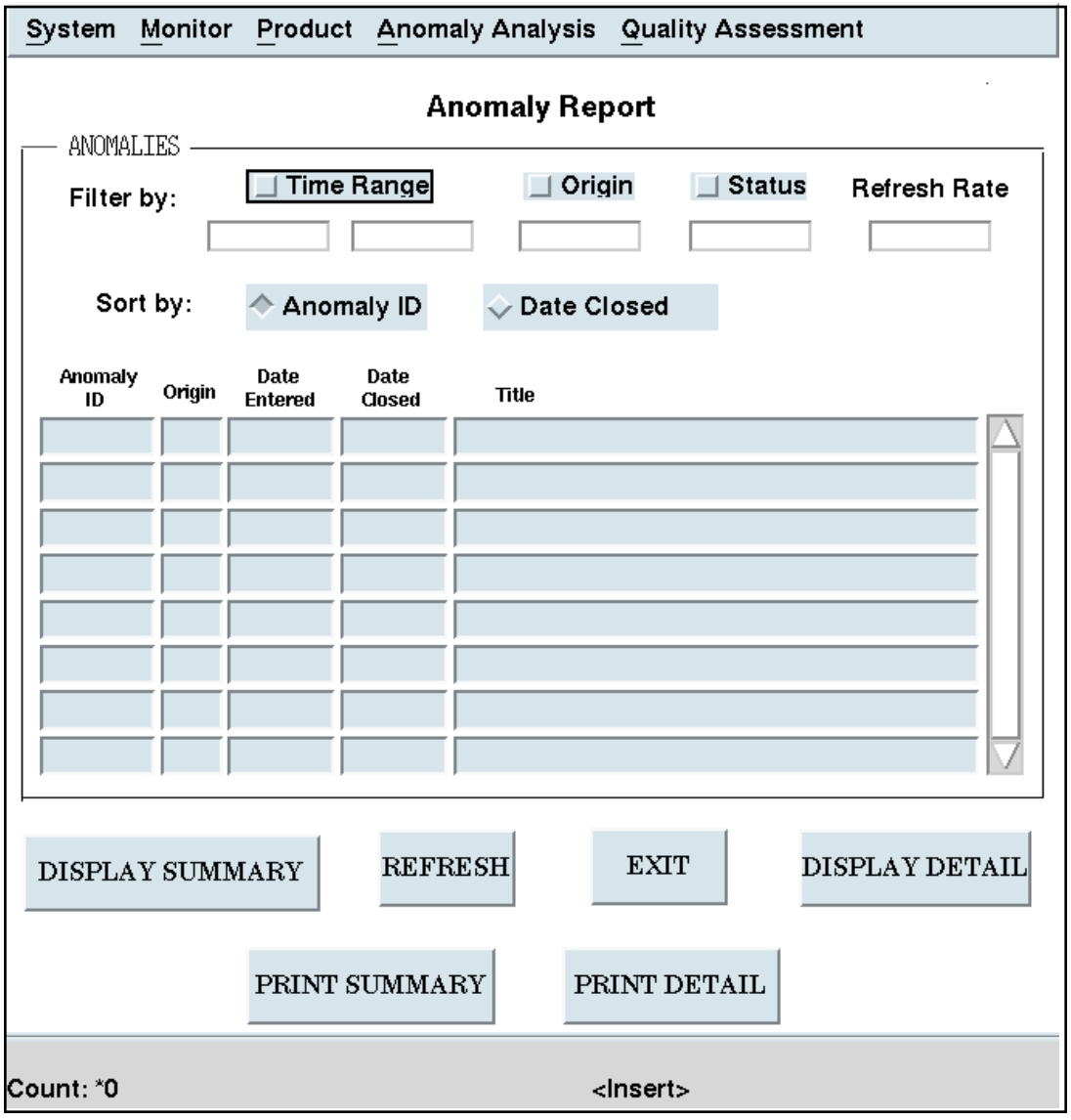
LPGS Critical Design Review

AAS Edit/Close Anomaly Screen



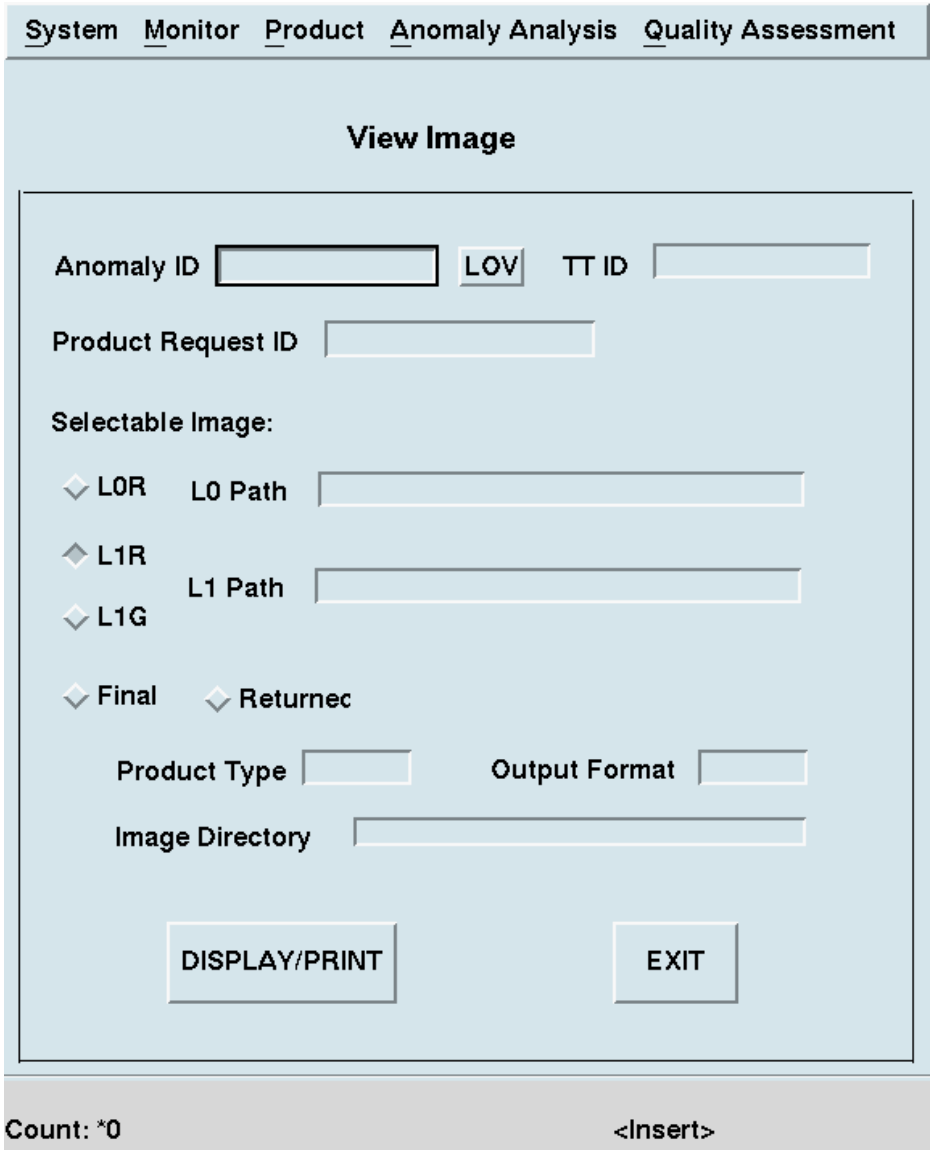
LPGS Critical Design Review

AAS Anomaly Report Screen



LPGS Critical Design Review

AAS View Image Screen



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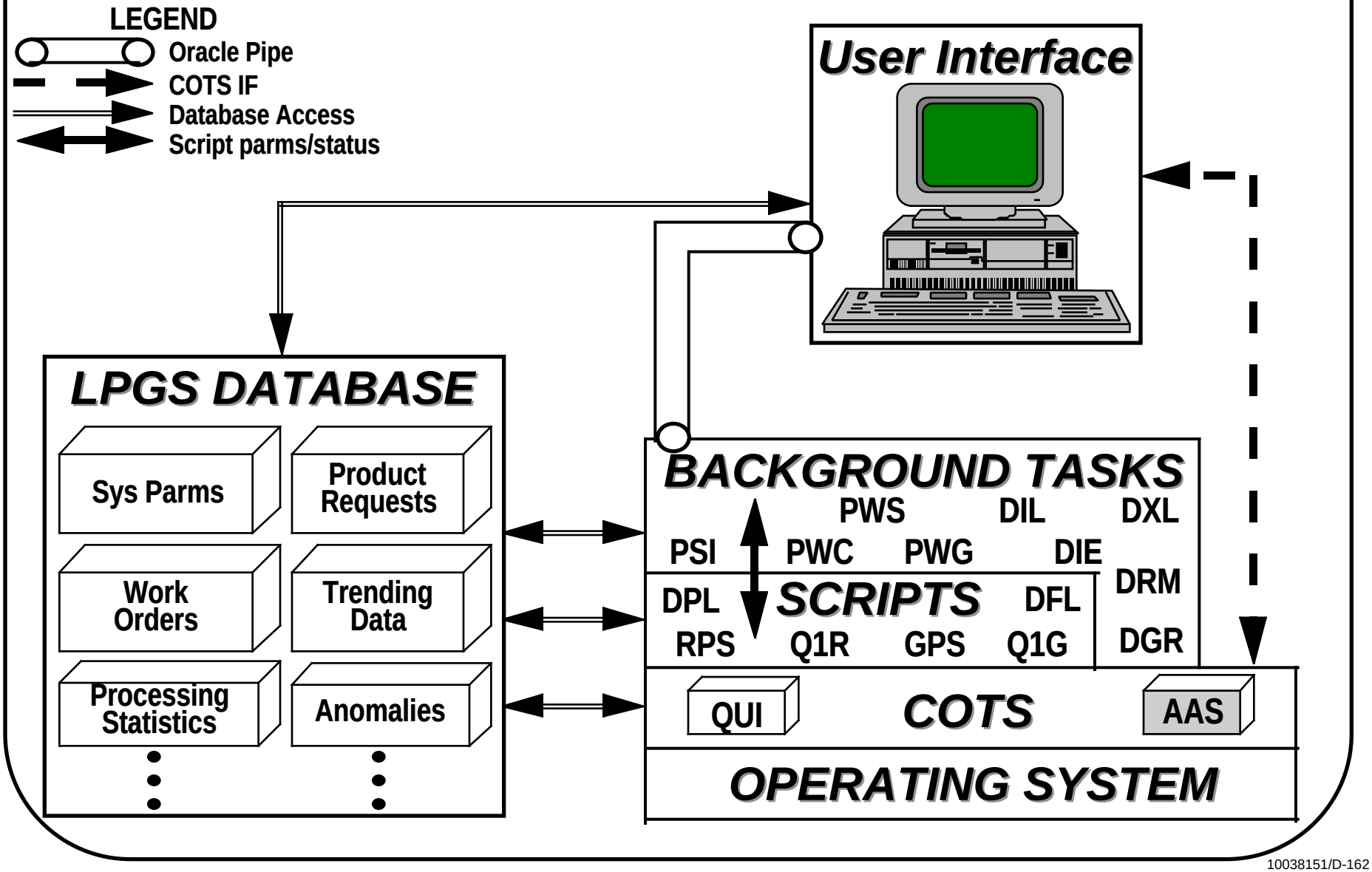
LPGS Critical Design Review

LPGS DMS, PCS, RPS, GPS, QAS, and AAS Software Architecture



LPGS Critical Design Review

AAS Open Issues

- COTS product not yet selected for viewing images
- If AAS successfully generates an L1 product for a trouble ticket, should product be
  - Deleted and ECS be required to regenerate product request?
  - Saved so that ECS can coordinate a transfer of corrected product?
  - Automatically transferred to ECS?

LPGS Critical Design Review

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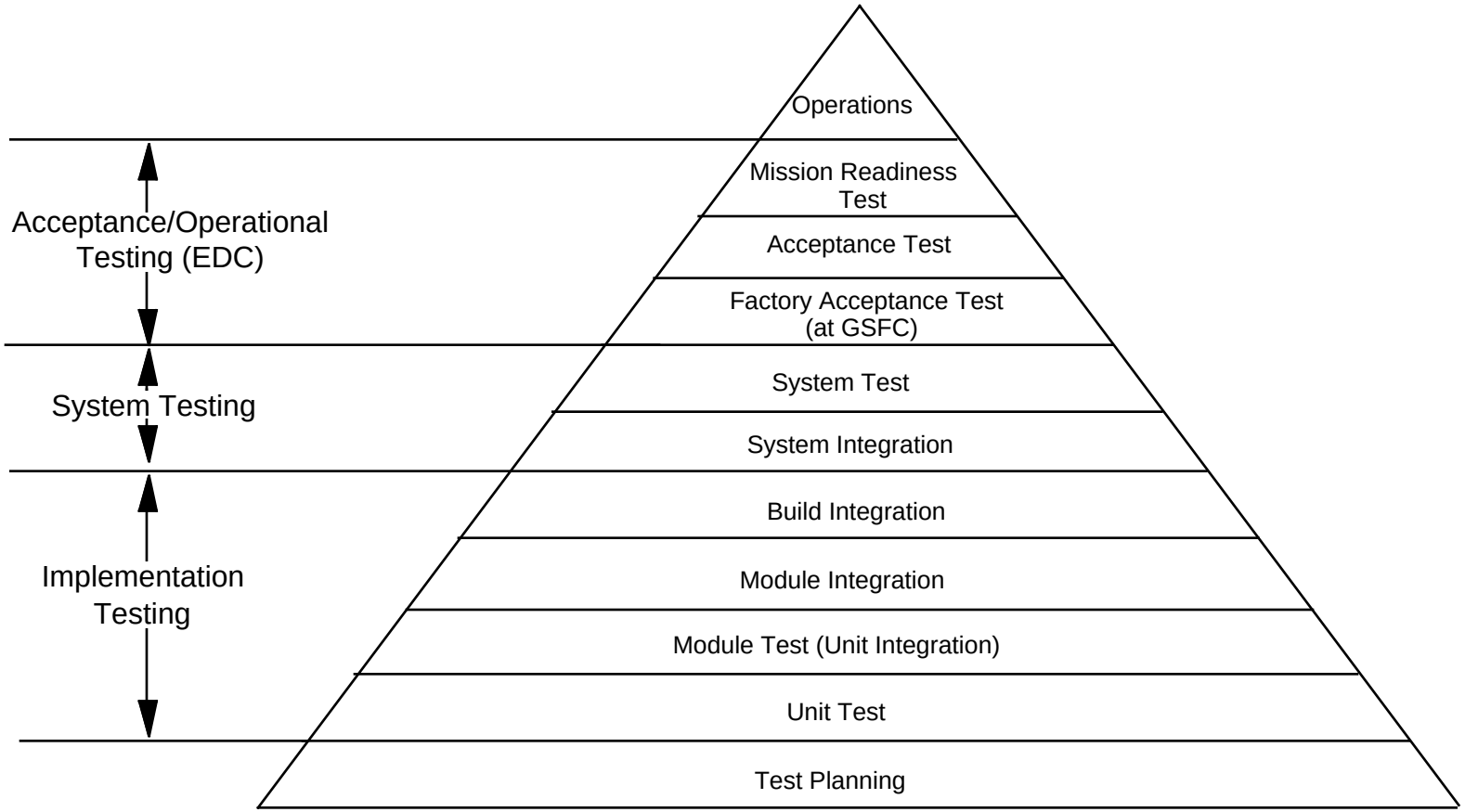
LPGS Critical Design Review

System Test

- System test objective
- System test products
- Configuration control activities
- System test activities
- System test tools

LPGS Critical Design Review

System Test Objective



LPGS Critical Design Review

System Test Objective (Cont'd)

- **Verify that LPGS satisfies LPGS functional and performance requirements according to baselined documentation using a requirements verification matrix**
  - **LPGS Functional and Performance Requirements Specification**
- **Maintain requirement traceability using Integration and Test Report system (in Access)**
  - **This tracking system is used to map requirements to test case and procedures along with a reporting feature to track testing progress during system test phase**

LPGS Critical Design Review

System Test Products

- **LPGS System Integration and Test Plan**
  - **Documents plan and requirements for development verification and validation**
- **System Test Procedures**
  - **Contains detailed procedures for each release test; generated 1 month before beginning system testing for each release**
- **Test Procedures Walkthrough**
  - **Conducted 3 weeks before beginning of each release test; ensures that proposed test procedures adequately describe operation of system and verify system requirements implemented for current release**

LPGS Critical Design Review

System Test Products (Cont'd)

- **System Test Readiness Review**
  - **Conducted 1 week before beginning of each release test to ascertain project's readiness to proceed with system testing**
- **System Test Reports**
  - **Generated within 4 weeks of completion of each release test**

LPGS Critical Design Review

Configuration Control Activities

- Maintain configured test tool library
- Maintain test data catalog
- Document each test environment (i.e., hardware elements and software versions) via a checklist audit before start of test period
- Establish and maintain software and hardware baselines
- Provide cleanup and maintenance of test environment after each release test
- Receive software turnover from development group
- Promote units to test environment
- Build system executables
- Copy system executables to test environment
- Prepare software delivery packages

LPGS Critical Design Review

System Test Activities

- **Ensure testability of functional and performance requirements**
- **Develop System Integration and Test Plan**
  - **Test data requirements**
  - **Test tool identification**
  - **Establish test schedule**
- **Develop necessary test tools**
- **Develop System Test Procedures**
  - **Create test scenarios**
  - **Generate test data sets**
  - **Verify test tools**
  - **Develop detailed test schedule per release**

LPGS Critical Design Review

System Test Activities (Cont'd)

- Conduct System Test Readiness Reviews
- Integrate system components
- Execute system tests
- Generate System Test Reports

LPGS Critical Design Review

System Test Tools

Tool/System	Used For
GTSIM/LPS/dcs	Generating test data
EOSView	Viewing contents of HDF files
vshow	Viewing contents of HDF files
GEOTIFF dump	Viewing contents of GeoTIFF files
FAST dump	Viewing contents of FAST files
look-db	Viewing database contents
check-static-data	Viewing database changes
ECS_Sim	Simulating ECS interface